A McGraw Hill Publication

August 28, 1961

Electrical World

Price One Dollar

The Electrical Industry's Weekly Magazine

Fourth of Six Reports for 1961

EUM

Starts on p 51

Balloons 'Air-Lift' Pulling Lines Across Straits

UNIV MICROFILMS INC
EDITORIAL DEPT
313 N FIRST ST
ANN ARBOR MICH

ALLIS-CHALMERS

ORIGINATORS OF 5/8% STEP REGULATORS

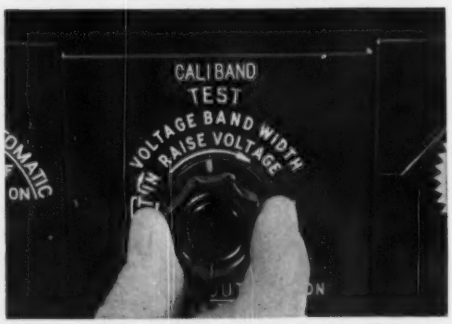
Insist on complete UNIT CONSTRUCTION to speed untanking...

bring maintenance out into the open

Unit construction of the JFR regulator simplifies untanking — brings all components and connections into full view! You make *all* internal inspections without breaking any electrical or mechanical connection. And you can *operate* the regulator for testing while the unit is untanked.

More JFR maintenance cost-cutting features: Oil sight gauge lets you check oil level at a glance. Unidirectional breather removes moisture and gases formed during tap changes. Quick-break mechanism is simple, rugged with a minimum number of moving parts for long, maintenance-free life. Externally-mounted by-pass arrester offers positive, visual proof of series winding protection.

Should you need a regulator replacement part — A-C maintains nationwide stocks. *Specify* **Allis-Chalmers** *Regulators . . . call, write or wire your nearby A-C office.*



Exclusive CALIBAND control cuts control-setting time without changing customer voltage or line-drop compensator settings.

Caliband is an Allis-Chalmers trademark.

A-1419

Published for 87 years for those engaged in the business of generating, transmitting, distributing, or applying electric power

Electrical World

August 28, 1961
Vol. 156, No. 9

Dateline . . .

Rough Times Ahead on the Washington Scene

Washington, D. C. "It's going to be a long, hard winter." That's the latest prediction for the political climate in which the nation's power companies will be operating from now on. This is based on growing evidence that federal power advocates are about to launch a drive to soften up the ground before seeding their power development program in 1962.

The prediction also can be judged against **(1)** the long-range strategy of the Kennedy Administration—little changed since January—and **(2)** the recent, bitter tactics growing out of the Hanford battle on Capitol Hill.

• After the smoke cleared away from last year's Presidential campaign, and the "New Frontier" settled down to running the government this spring, it became evident that this first year of the new Administration would be spent (and needed) to decide where and how an expanded federal power program could be effected. The second year would see the first fruits of these plans start blossoming on Capitol Hill.

Planning is under way on water resources, revising present multipurpose feasibility standards, a new "regional preference" measure for the Pacific Northwest, interties, transmission lines, new power projects, a national fuels and energy policy, plus many more. Few of these will be ready for actual consideration until 1962 or so.

The first year also would be used to test the political climate—the support and criticism—in which these plans could be developed.

It appeared earlier this year that some of the cornerstones of the Administration's power program could be laid without much opposition; and the major effort would be concentrated on planning. Early political readings indicated the Hanford power facilities would be a "pushover" for federal power supporters. The Upper Colorado transmission lines were advanced as "non-partisan" because the outgoing Eisenhower Administration had recommended them, before President Kennedy's recommendation. Pres Kennedy had promised creation of a "Natural Resources Council" during his campaign. These moves were in addition to repeating legislation to

(*Continued on page 5*)

Publisher Warren W Shew
Editor Charles F Hochgesang
Senior Editors Daniel T Braymer, Leonard M Olmsted, Jesse A Mock
Managing Editor Herbert R Frankel

ENGINEERING

Southeastern Editor Edward Allen, Atlanta
Midwestern Editor Francis J Kovalcik, Chicago
Western Editor Paul H Leech, San Francisco
New England Editor Howard S Knowlton, Boston
Middle Eastern Editor Bruno Zambotti
Northeastern Editor Willard L Felsen
Methods Editor Michael G McGraw
Associate Editor George Swift
Overseas Correspondent J H M Sykes, London
Consulting Editor Archer E Knowlton

NEWS

News Editor Dale VanHorn
Associate Editor Leon A Allen, Jr
Supply Lines Editor Paul F Roman
Assistant Editor William P Kennedy
Washington Correspondent N Burkey Musselman

ART & PRODUCTION

Art Director Frank C Stockman
Assistant Art Director Pressly Donald
Assistant Editor Steven Ludwig
Editorial Assistant Earl J Carter

Mfrs News Editor Michael G McGraw
Assistant Editor Elizabeth R Parker

Mgr, Mkt Research Arthur J Stegeman

Commercial Editor John D Damon

ADVERTISING

Sales Manager Walter R Klein

District Managers E B Sessions, J B Roll, Jr, New York; D L Roberts, Boston; E A Martin, Philadelphia; E F Coffey, Jr, Cleveland; E F Coffey, Jr, Detroit; M S Kearney, Pittsburgh; W H Meneilley, J T Schaefer, Chicago; J T Schaefer, St. Louis; Robert Yocom, Los Angeles; T H Carmody, John Hernan, San Francisco; Robert H Powell, Atlanta; John Grant, Dallas; D O Hanson, Houston; Carl Coash, Jr, Denver; Scott Hubbard, Portland, Ore.

Business Manager Otto A Drechsel
Asst Business Mgr John F Dugan

Promotion Manager Donald K Ellis

Circulation Manager S A La Faso

DOING TWO JOBS AT ONCE—Burying Okolite insulated 15kv underground cable at the same time water pipes were laid,cut installation cost for The Mead Corporation. Naturally, cable failure can not be tolerated once this system is completed.

THE FINAL QUALITY TOUCH—Using Okonite "Cable-Matched" tape . . . a workman completes the job at the termination. Okonite quality splicing materials make splices and terminations as reliable as the cable.

THE MEAD CORPORATION USES OKOLITE CABLE FOR...

The MAXIMUM in circuit security
The MINIMUM in long-term cost

The Mead Corporation, one of the world's largest paper manufacturers, has used Okolite insulated cables for many years. The expanding Okolite cable system at their main mill in Chillicothe, Ohio opens the way to greater production capacities to handle an increasing market demand for Mead paper products.

There are many unique factors about the Chillicothe mill. To begin with, the plant is completely dependent on well water for its operation. Any failure in the pumping equipment means an immediate shutdown. To secure the maximum in circuit security and to obtain installation economies, the cable was buried at the same time new water pipes were being laid. Okolite-insulated cables—a 15kv cable for a 2½ mile main circuit and 5kv Okolite cable for two feeders linking transformers and pumping stations—helps to assure the trouble-free service so necessary for Mead.

The Okolite insulated cables installed at Mead were manufactured by the strip process to guarantee perfectly centered conductors and years of optimum circuit security. Find out what Okonite Cable'bility* can mean in reducing the long-term cost of your own vital installations. For complete details write for Bulletin EW-1085, The Okonite Company, Subsidiary of Kennecott Copper Corporation, Passaic, N. J.

*Cable'ability . . . cable craftsmanship since 1878

***where there's electrical power . . . there's* OKONITE CABLE**

Electrical World

Dateline . . .

Washington, D. C. (*Continued from page* 3)
authorize the Burns Creek and Fryingpan-Arkansas projects.

Little "softening up" seemed necessary, as little resistance seemed to be developing. In fact, some political commitments, involving federal power measures, were made without much checking to see that they could be assured.

• But the cold light of reality has come on the scene. Hanford has received two heavy blows in the House of Representatives. Pres Kennedy has given up his plan to set up an independent Natural Resources Council, Burns Creek again is in its perpetual "hot water," Fryingpan-Arkansas again is sitting before the House Rules Committee, and a big fight on Upper Colorado transmission lines seems imminent.

A major effort to prepare the path for federal development now seems certain—and quickly—to shore up some of the sagging cornerstones. It will be an all-out attack on power company operations in an attempt to neutralize their effectiveness. The internal squabble between Pres Kennedy and some Democrats regarding the Natural Resources Council probably will be forgotten in the new attack on utilities.

Attacks on utilities began last week. Said Sen Clinton Anderson (D-N. M.), "I hope the private utilities and their allies will come to their senses (about opposing Hanford) before great harm is done . . . to the private utilities." He implied removal of rapid amortization "and other tax rebates utilized by the utilities."

Rep Chet Holifield said, "Once again I warn the privately owned utilities to guard their luscious bone of captive customers, noncompetitive franchises, guaranteed profits, and rapid amortization. In their dog-in-the-manger selfishness, they might start a train of events which could result in the loss of the luscious bone they now have."

Letters

Sees Soviets 'Catching Up'

To the Editor:

I read with considerable interest (Philip) Sporn's article (EW, May 29, p 50) entitled "Soviet Shift to Big HP Steam Units Holds No Surprise."

In the course of his article Sporn sets forth some comparative data covering the annual kwhr output and installed generating capacity in the USSR and the US, using statistics not only for the recent past but also the projected future. As Sporn says, the figures as to annual kwhr output are "properly comparable," going on to state that at least until 1965 the USSR projections are "ambitious but solid" and that the projections made at the beginning of the seven-year program for the first and second years "have quite likely been achieved," and that "the projections for later years may also be achieved."

What Sporn's kwhr output figures neglect to show is that the Soviets show distinct signs of "catching up" with the US in the field of electric energy, even though the US has the advantage of a wide head start. An increase in a relative level of kwhr output up from ⅓ to nearly ¾ of the US in 20 years should give all thinking persons cause to reflect.

Annual Kwhr Output (Billions of Kwhr)

	USSR	Total US	USSR as % of US
1958	238	725	33%
1959	264	795	33%
1960	—	841	—
1965	520	1,200	43%
1970	900	1,750	51%
1975	1,500	2,375	63%
1980	2,300	3,200	72%

With respect to installed generating capacity, Sporn comments that there is "nothing new or startling in the Russian figures," saying only that "the 1980 figure of close to 500 million kw will, if attained, represent a major achievement." He concludes that there can be no doubt that US capacity will exceed Russia's by a substantial margin. Again, what is left unsaid is the

(*Continued on page* 118)

ELECTRICAL WORLD
Vol. 156, No. 9 August 28, 1961

Published weekly by McGraw-Hill Publishing Co., Inc., James H. McGraw (1860-1948), Founder. Executive, Editorial, Circulation and Advertising Offices: McGraw-Hill Building, 330 West 42nd Street, New York 36, N. Y.

Officers of the Publications Division: Nelson L. Bond, President; Shelton Fisher, Wallace F. Traendly, Senior Vice Presidents; John R. Callaham, Vice President and Editorial Director; Joseph H. Allen, Vice President and Director of Advertising Sales; A. R. Venezian, Vice President and Circulation Coordinator; Daniel F. Crowley, Vice President and Controller. **Officers of the Corporation:** Donald C. McGraw, President; Hugh J. Kelly, Harry L. Waddell, Executive Vice Presidents; L. Keith Goodrich, Executive Vice President and Treasurer; John J. Cooke, Vice President and Secretary.

Subscriptions are solicited from executive, supervisory, and engineering personnel in electric utilities, manufacturing companies, and related fields; and from consulting engineers and electrical engineers in industry. Position and company connection must be indicated on subscription orders. ELECTRICAL WORLD is available only by paid subscription. Publisher reserves the right to refuse non-qualified subscriptions. Please send to the address shown in the box below.

United States and possessions subscription rate for individuals in the field of the publication $6.00 per year; Canada $7.00; single copies one dollar. Other Western Hemisphere and the Philippines $20.00 payable in advance and other countries $30.00 payable in advance.

Printed in Albany, N. Y.; second-class postage paid at Albany, N. Y. Title ® registered in U. S. Patent Office. © Copyrighted 1961 by McGraw-Hill Publishing Co., Inc. Quotations on bulk reprints of articles available on request. All rights reserved, including the right to reproduce the contents of this publication either in whole or in part. Permission required to reproduce any of contents.

Unconditional guarantee: On written request from any subscriber, the publisher agrees to refund the unused portion of the subscription price if editorial service is unsatisfactory.

SUBSCRIPTION AND ADDRESS CHANGES: Send subscription correspondence and change of address to Fulfillment Manager, ELECTRICAL WORLD, 330 West 42nd Street, New York 36, N. Y. Change of address notices should be sent promptly; provide old as well as new address; include postal zone number, if any. If possible, attach address label from a recent issue. Please allow one month for change to become effective.

Postmaster . . . Please send form 3579 to Electrical World, 330 W. 42nd St., New York 36, N Y

9:02

Motor stopped; disassembly begun.

9:20

Sufficiently disassembled
to permit bearing inspection.

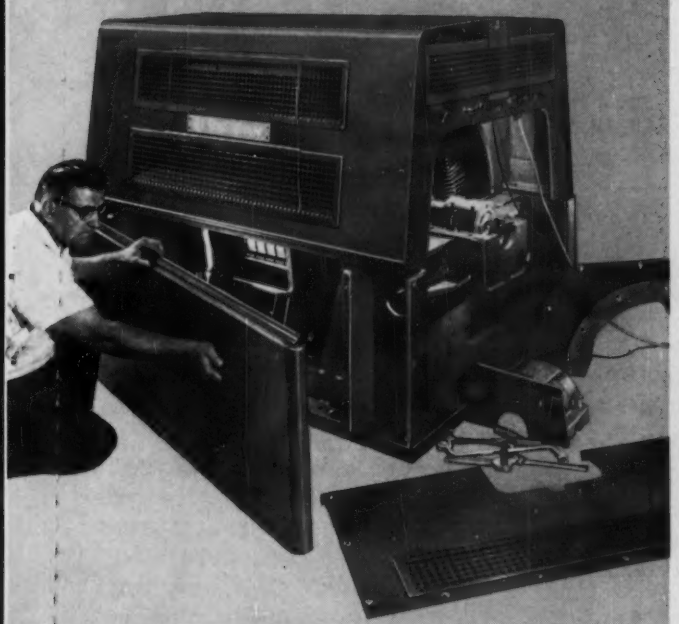
Westinghouse F/A motor completely disassembled in 90 minutes

"F/A" means "Fully Accessible" . . . Only 90 minutes are required for a complete disassembly. After cleaning, inspecting and servicing, the F/A motor can be completely reassembled and put back in operation in about two hours.

No other motor can be serviced so quickly. One electric utility maintenance engineer estimates that

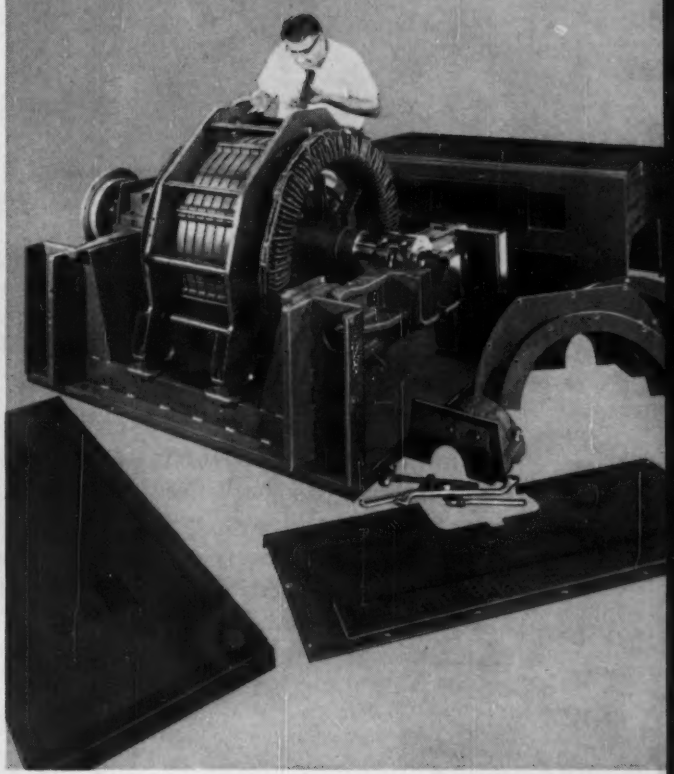
9:40

End covers, side panels, air shields removed. Winding inspection now possible.



10:32

Complete disassembly possible for major cleaning, inspection and servicing.



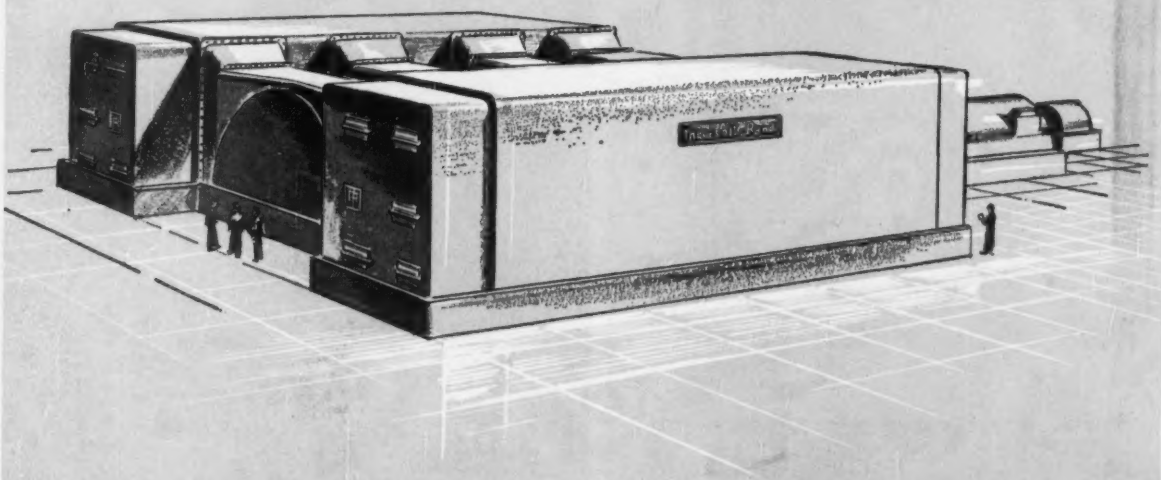
a Westinghouse F/A motor can be serviced in about one-fourth the normal time.

F/A motors are available in ratings from 250 hp/600 rpm to 7,000 hp/3600 rpm. For more information, call your Westinghouse Representative. Or, write Westinghouse Electric Corporation, P.O. Box 868, Pittsburgh 30, Pa. *You can be sure . . . if it's*

Westinghouse

J-15022

Adding new dimensions — *to engineering*



Ingersoll-Rand twin-shell steam condenser with 500,000 sq. ft. of surface integrated with a large capacity dual side exhaust turbine.

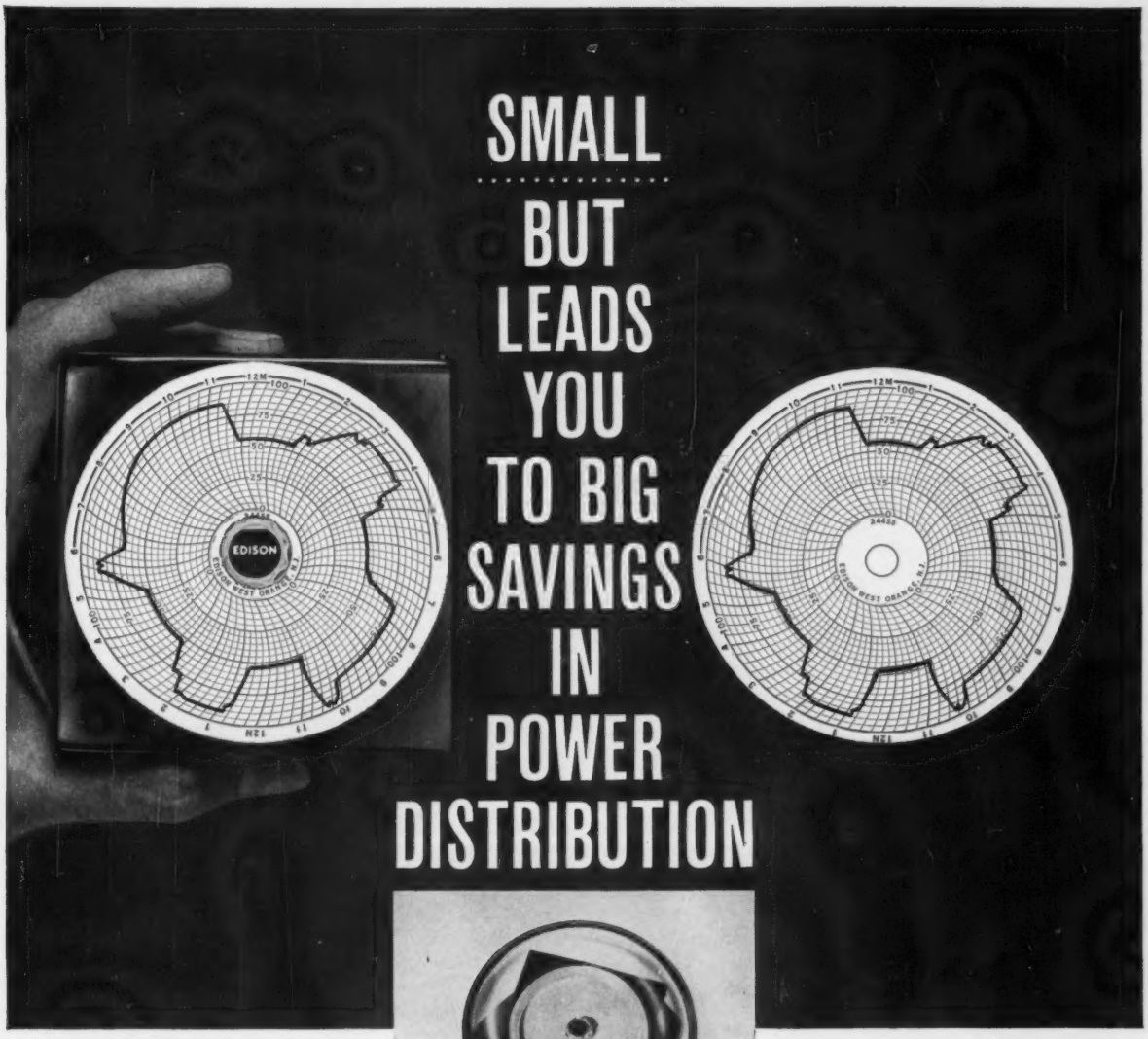
Are you thinking big in kilowatt capacity? We are!

That's right! We're thinking in terms of tomorrow's "super capacity" generating units, and how our steam condensers will best fit into the shape of things to come. We're studying ways to further optimize steam flow paths... to reduce water requirements... to minimize space needed for installation. In short, *we're thinking big to build them smaller*— to provide the power industry with the highest performing and the most compact steam condensers for any type and size of generating unit.

PUMPS • CONDENSERS • EJECTORS & VACUUM PUMPS
AIR & ELECTRIC TOOLS • AIR COMPRESSORS

Ingersoll-Rand.
269A4 11 Broadway, New York 4, N.Y.

SMALL BUT LEADS YOU TO BIG SAVINGS IN POWER DISTRIBUTION



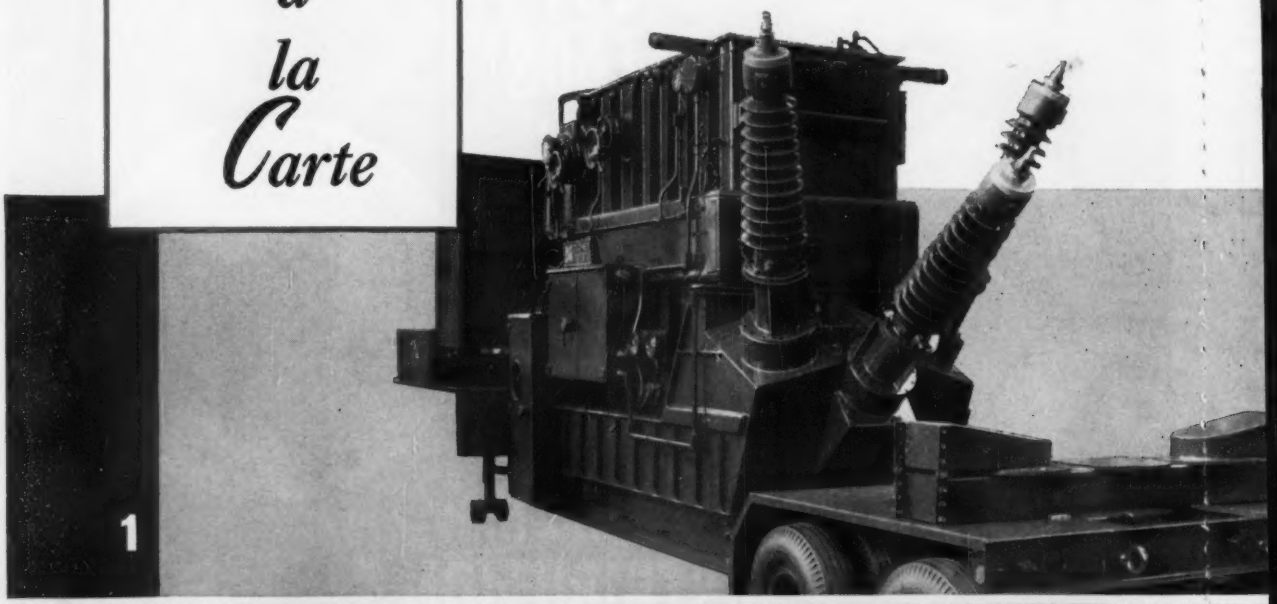
WEATHER PROOF HOUSING

This compact instrument is the Edison Omnicorder—an accurate yet inexpensive tool that gives you a continuous *record* of fluctuations in electrical load. By using it at strategic points within your distribution system, you can gather data of great economic value in your day-by-day, hour-by-hour matching of station and line facilities to customer load demands. In like manner, you can achieve optimum performance with cost savings in your design of new circuits and selection of components. Available in weather-proof enclosure, the unit is temperature compensated for reliability in any weather; may be panel or bulkhead mounted; has no ribbon, pen or ink that require servicing. Omnicorders can also be used to advantage in sub-stations on *voltage regulators, reclosers, transformers* and *power switching apparatus.* Edison Omnicorder offers a choice of four types of meter movements to measure a wide range of AC and DC electrical quantities, all the way from thermocouple outputs to currents as high as 100 amperes.

For complete information, please write requesting Catalog 3057.

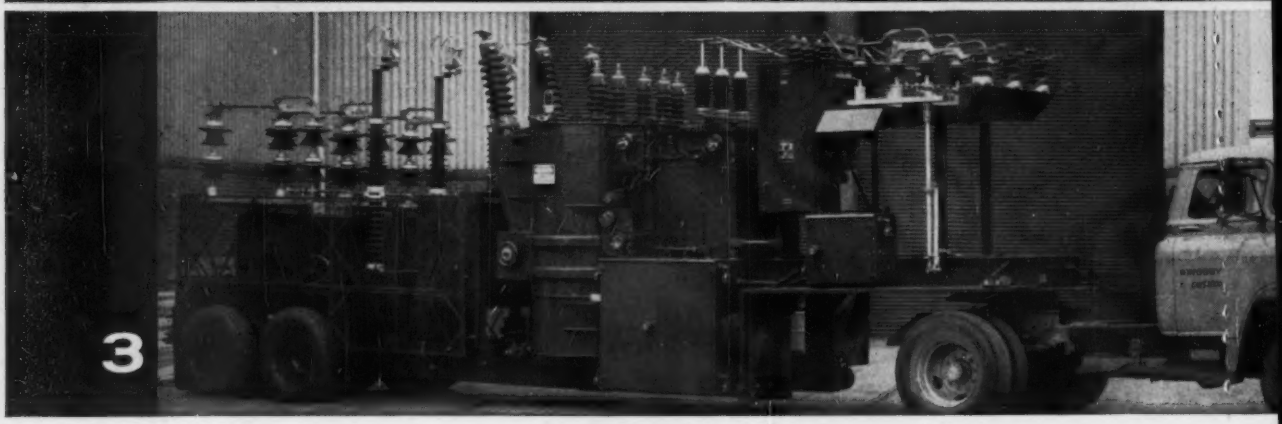
Thomas A. Edison Industries
INSTRUMENT DIVISION
39 LAKESIDE AVENUE, WEST ORANGE, N. J.

Service a la Carte



1

2



3

Service a la carte—versatile Moloney Mobile equipment—custom designed to your specifications—provides capacity for serving new loads, by-passing permanent installations, and restoring service in emergencies. The application flexibility of Moloney Mobiles reduces investment in reserve capacity and assures service continuity over a wide area of your system.

— MOLONEY MOBILES

When you buy equipment—remember Moloney Electric's transformer experience and facilities are well suited to provide—service a la carte—mobile units with capacity and voltage combinations to meet a wide range of specific needs.

MOLONEY MOBILES IN SERVICE INCLUDE:

1. 15,000 KVA, H.V. 66 x 132 KV Delta, L. V. 2540/4400Y/2540 x 7620/13200Y/7620 Volts, series-multiple and delta-wye externally operable switches.
2. 7500 KVA, H.V. 60 Grd.Y/34.6 KV, L.V. 12.470 Grd.Y/7200 Volts.
3. 7500 KVA, LTC, H.V. 69.6 Grd.Y/40.2 KV, L.V. 12.470 Grd.Y/7200 Volts.
4. 2500/3125 KVA, H.V. 67 KV Delta, L.V. 2540/4400Y/2540 x 7620/13200Y/7620 Volts, series-multiple and delta-wye externally operable switches.
5. 9000 KVA, H.V. 64.35 KV Delta, L.V. 12470Y/7200 x 24940Y/14400 Volts.

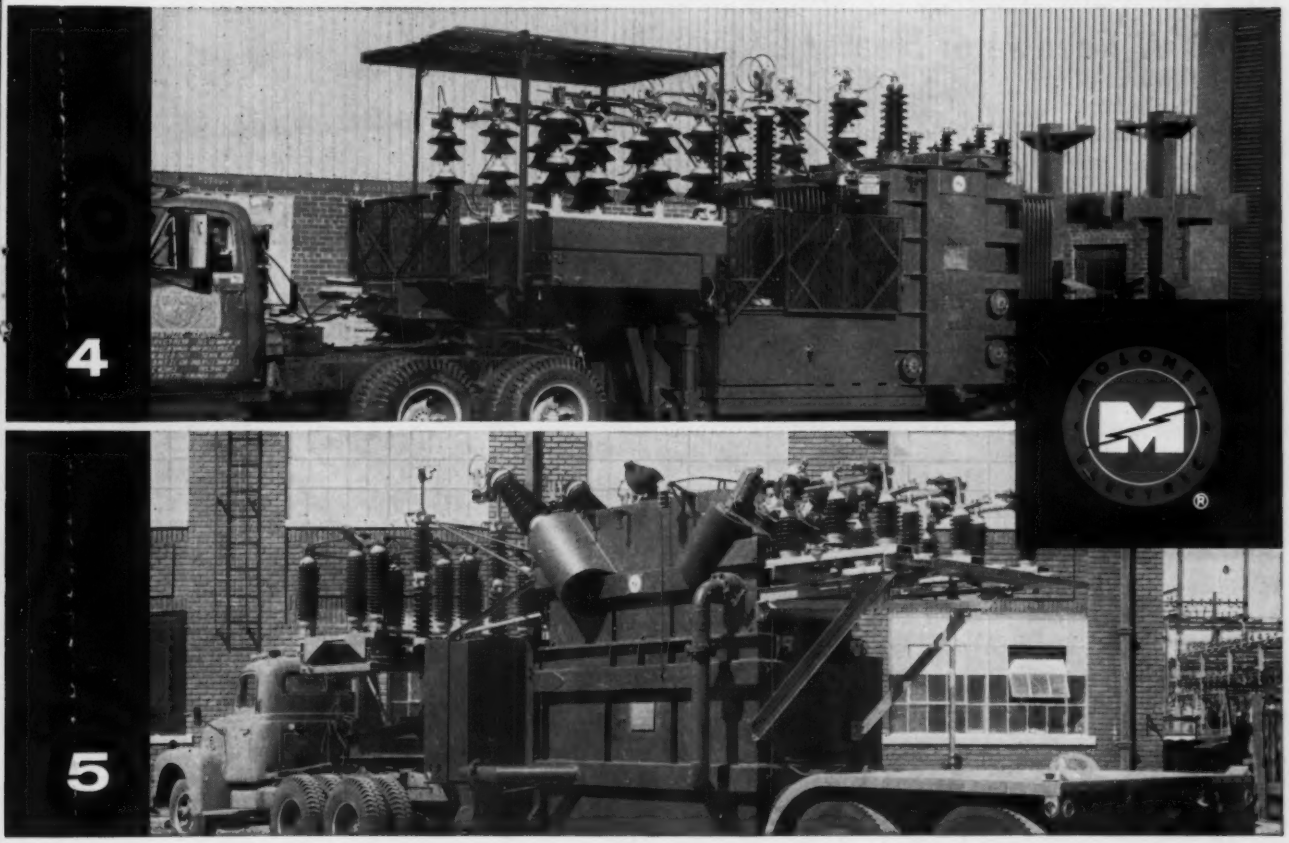
ME61-16

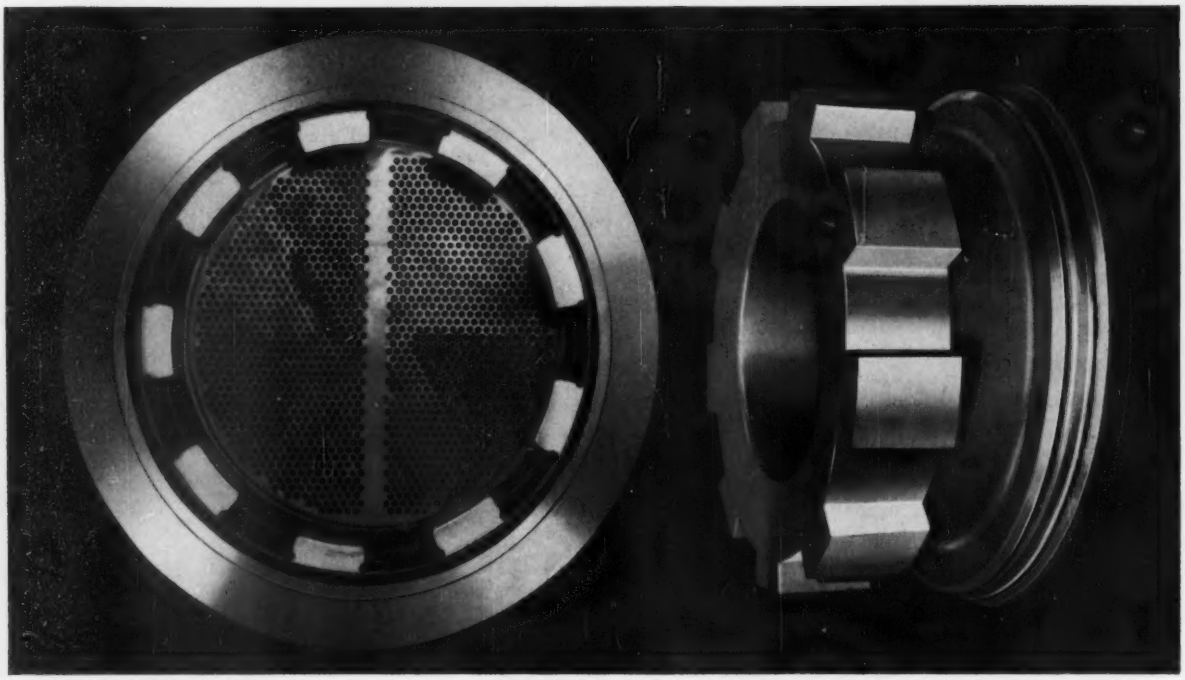
MOLONEY ELECTRIC COMPANY

Manufacturers of Transformers and Switchgear for Utilities, Industry, and Electronic Applications

FACTORIES AT ST. LOUIS 20, MISSOURI, AND TORONTO, ONTARIO, CANADA

SALES OFFICES IN ALL PRINCIPAL CITIES





Simplicity and Easy Maintenance

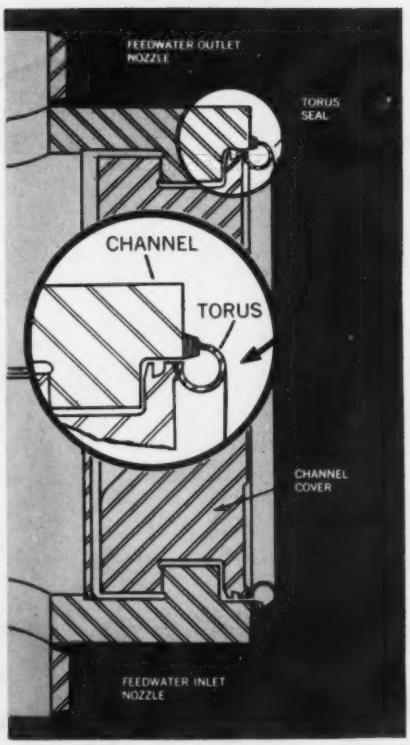
win quick acceptance by Utilities for new FW Feedwater Heater Closure

U.S. utilities had their first look at this new gasketless Breech-Lockhead for feedwater heaters last year. Decisions to buy followed quickly among leading utilities including Pacific Gas and Electric, Omaha Public Power District, Toledo Edison Company, and Gulf States Utilities.

Why such fast acceptance from an industry which must weigh every advance with extreme care? Because the FW Breech-Lockhead closure combines two proven principles—the torus and the breech-lock—the best way yet devised for achieving simplicity and ease of maintenance with a *positive seal*. The torus, welded to the edges of the channel and cover, provides a fully *leakproof seal independent of hydrostatic pressure*.

Disassembly and reassembly of the closure is quick and easy. Since the torus is only a seal it is readily cut away from the channel, and remains attached to the pressure cover. The pressure cover is then quickly removed. Simple tools, supplied with the heater, make cutting, removal, replacement and rewelding a routine procedure.

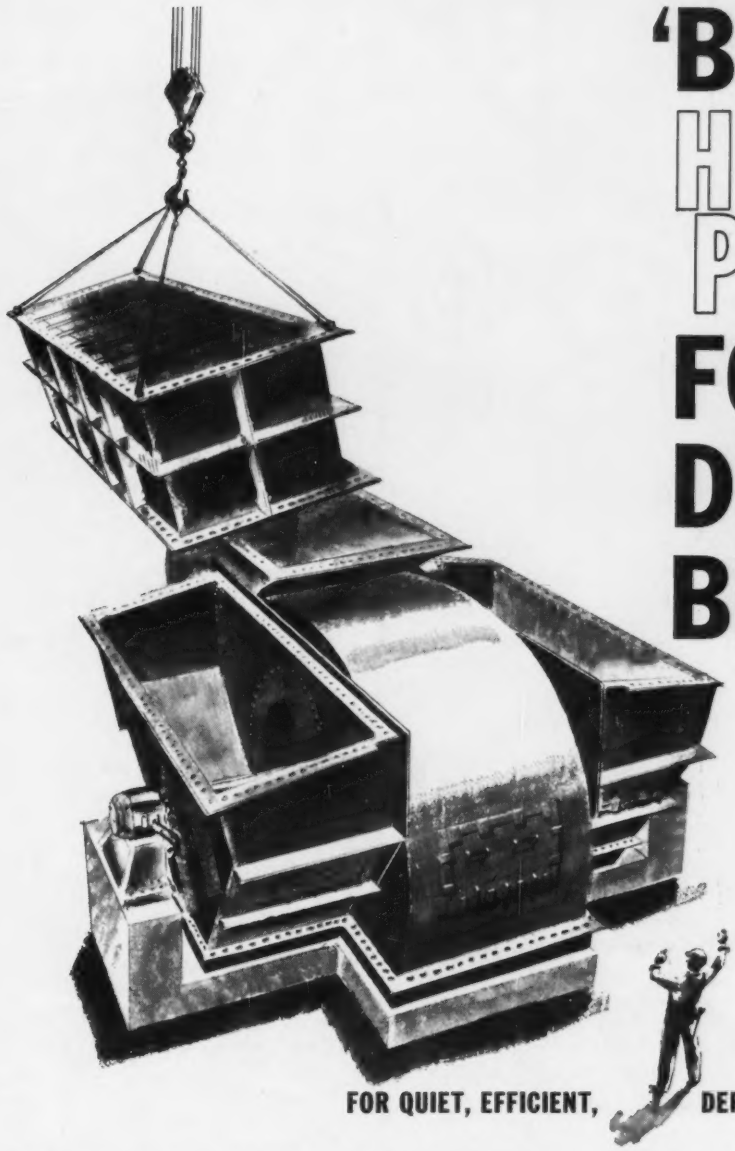
If you are now considering feedwater heaters, get full technical information on this new Foster Wheeler Breech-Lockhead. It will simplify your maintenance. Foster Wheeler Corporation, 666 Fifth Avenue, New York 19, N.Y.



FOSTER WHEELER

NEW YORK TORONTO LONDON PARIS MILAN TOKYO

'BUFFALO' HIGH PRESSURE FORCED DRAFT BLOWERS



FOR QUIET, EFFICIENT, DEPENDABLE SERVICE

'Buffalo' blowers are "tailor made" to move greater volumes of air at higher static pressures (to 80 inches WG and beyond) and lower brake horsepower without excessive noise.

Buffalo makes over seventeen different types of draft fans in more than fourteen sizes and in all possible arrangements. Each has a smoothly contoured housing designed to provide a uniform flow of air from inlet rotor to ductwork. Depending on operating conditions, either the air foil or backward curved blade design will be specified.

Sound and vibration are dampened by the solid construction of both housing and inlet boxes to assure longer-lasting, vibration-free service. And, where required, additional attenuation may be engineered into the system.

You'll find our engineering representatives, located in cities throughout the country, qualified to assist you in selecting and operating the proper blower for your job.

"Buffalo"

AIR HANDLING DIVISION

BUFFALO FORGE COMPANY

Buffalo, New York

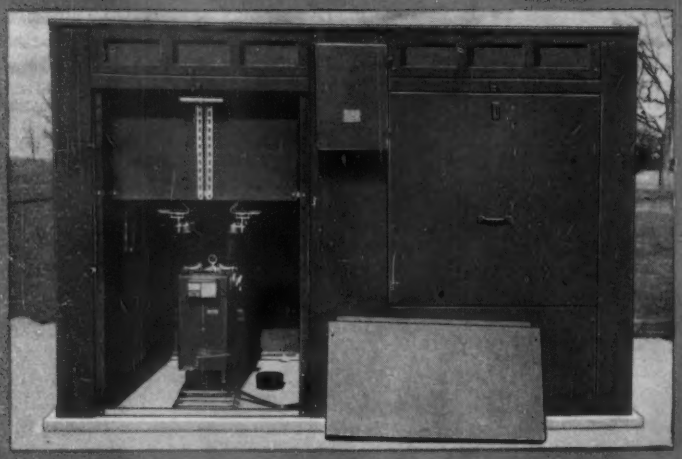
Canadian Blower & Forge Co., Ltd., Kitchener, Ont.

'Buffalo' Air Handling Equipment to move, heat, cool, dehumidify and clean air and other gases.

'Buffalo' Machine Tools to drill, punch, shear, bend, slit, notch and cope for production or plant maintenance.

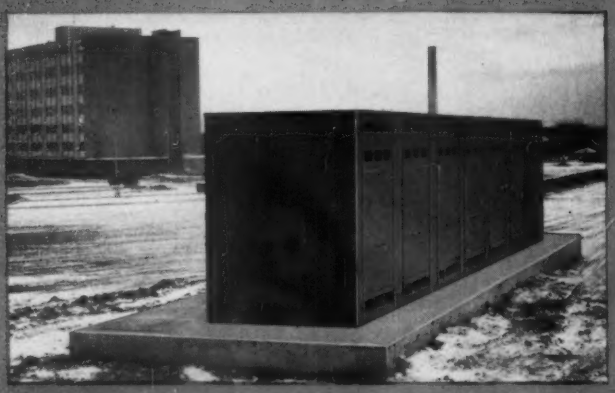
'Buffalo' Centrifugal Pumps to handle most liquids and slurries under a variety of conditions.

Squier Machinery to process sugar cane, coffee and rice. Special processing machinery for chemicals.

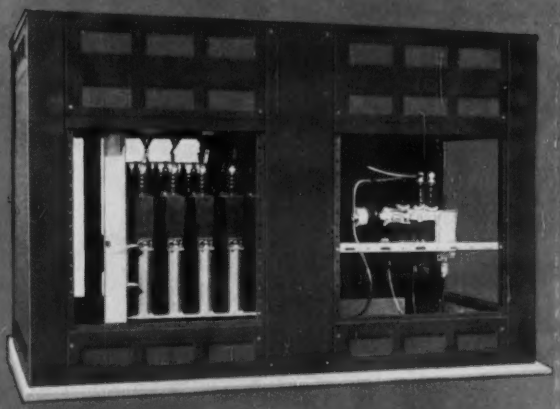


L-M TRANSCLOSURE HOUSING containing load transfer equipment. Switching is performed by two L-M 14.4 kv 400 ampere oil switches. Sensing voltage obtained from two potential transformers mounted in the housing activates the L-M type S control, which in turn opens and closes alternate circuits to assure a continuous flow of power to the load. Each oil switch is equipped with a manual group-operated disconnect switch to permit rapid and safe maintenance. When the manual disconnect switch is in the raised position, the oil switch can be rolled out of the housing for inspection or maintenance.

OVERHEAD RESIDENTIAL DISTRIBUTION was resulting in distortion of radio waves from a U. S. Air Navigation VORTAC facility 2000 feet away (left). It became necessary to install distribution underground. To avoid the high cost of underground vaults and submersible equipment, the utility used L-M Transclosure housings with conventional pole type distribution equipment (right). Results: L-M Transclosures provided an economical solution with better accessibility.



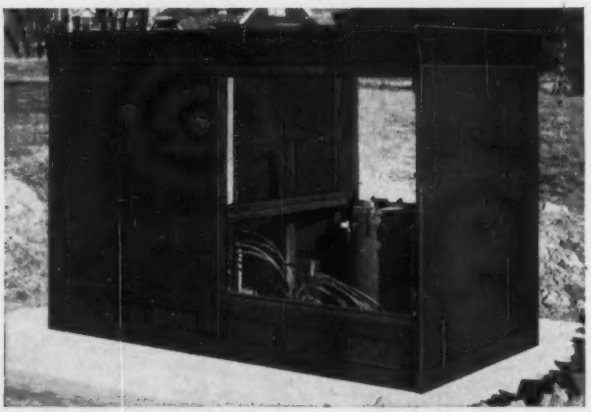
SEVEN L-M TRANSCLOSURE housings are ganged to provide safe protection for street lighting regulating and control equipment at West Allis, Wisconsin. Five regulators plus all controls for five lighting circuits are now housed in this attractive installation. A substantial saving over brick construction was realized.



THESE TRANSCLOSURES HOUSE a pre-fabricated 600 kvar, 3-phase capacitor block. Installation includes controls, switches and bus. Savings of thousands of dollars can be made over conventional housed capacitors.

L-M TRANSCLOSURE HOUSINGS PROVIDE ECONOMICAL 3-HOUR INSTALLATION

HIGHWAY LIGHTING, U. S. 141, WISCONSIN: To house transformer, protective and switching equipment for a 4-way highway intersection, L-M Transclosures were selected. Here they are, as they arrived, in crates. At 12:40 p.m. crew went to work.



3:50 P.M., THREE HOURS LATER. Transclosure frames were bolted to the pad, side panels attached, equipment installed, ready for wiring—all by a crew that had never before seen this equipment. Time was cut substantially as the crew gained experience.

CONTROLS FOR LIGHTING the athletic fields and parking lots at a midwest high school are contained in this Transclosure housing. The double unit shown contains seven L-M type NR oil switches, and high voltage primary terminations and fusing.

L-M's Transclosure™ Housings Economical For All Types Of Distribution Equipment

Modular construction and range of sizes ideal for all types of equipment including transformers, regulators, reclosers, switches, protective equipment, controls, meters, capacitors, load transfer equipment, arresters, buses and insulators.

L-M Transclosures are fabricated steel housings featuring modular design. They can be installed singly or ganged, in a variety of sizes, to house almost any imaginable type of distribution equipment. Additional units may be added at any time.

You have complete flexibility of installation. Transclosures can be installed outdoors at ground level on concrete pads for underground distribution. They are equally versatile on roof tops or indoors. You can install them anywhere. They eliminate the need of expensive vaults or masonry cubicles.

Adequate ventilation is provided for all equipment. Vents at top and bottom have baffles preventing the entrance of all foreign objects, including wildlife. Removable panels can be locked in place to prevent the entrance of all unauthorized personnel.

Get Specifications, Details

Contact your L-M Field Engineer. He's anxious to discuss your enclosure problem with you. Ask him for Bulletins on L-M Transclosure housings. Or write Line Material Industries, Milwaukee 1, Wisconsin

L-M TRANSCLOSURE HOUSINGS at Bartlett Memorial Hospital, Sapulpa, Oklahoma. Three Transclosures are ganged to enclose two 50 kva, one 75 kva distribution transformers, and current transformers. Metering cabinet is shown at end of unit. Complete erection, including assembly and bolting, required only 8 man-hours of labor.

OUR 50TH YEAR LM 1911 — 1961

LINE MATERIAL® Industries

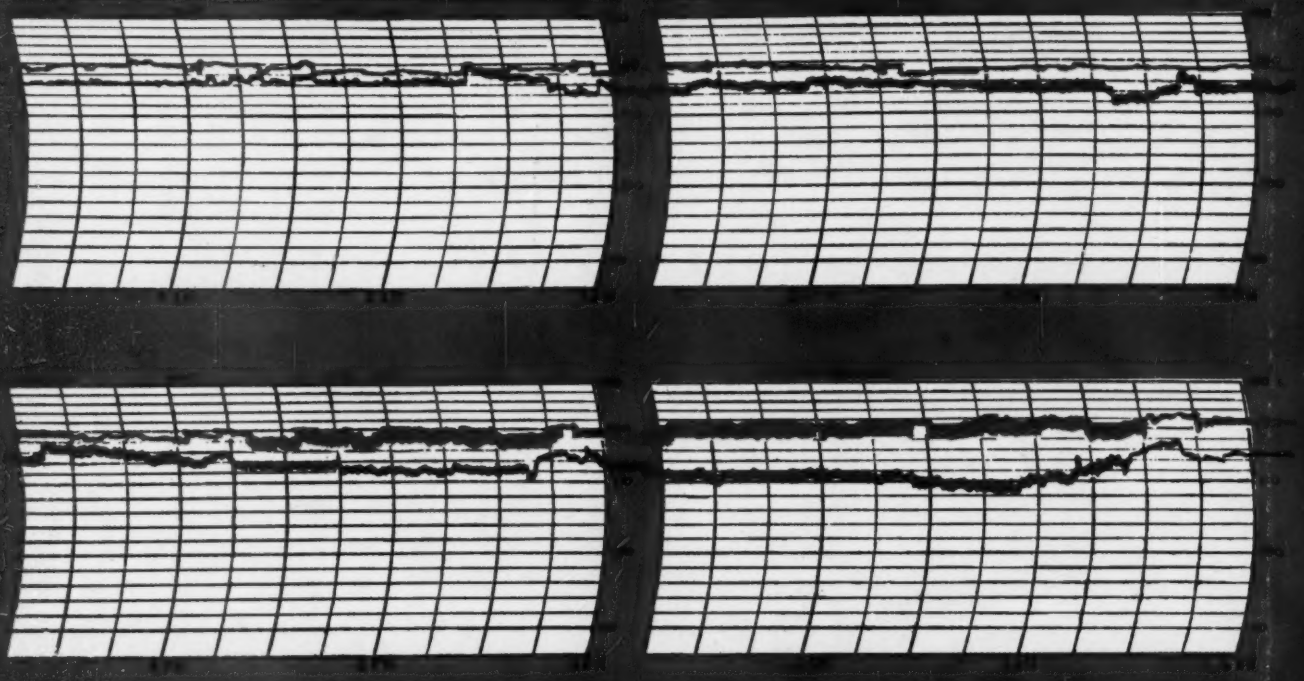
McGRAW-EDISON COMPANY

Transclosures

McGRAW EDISON

529

DISTRIBUTION TRANSFORMERS • RECLOSERS, SECTIONALIZERS AND OIL SWITCHES • FUSE CUTOUTS AND FUSE LINKS • LIGHTNING ARRESTERS • POWER SWITCHING EQUIPMENT
PACKAGED SUBSTATIONS • CAPACITORS • REGULATORS • OUTDOOR LIGHTING • LINE CONSTRUCTION MATERIALS • PORCELAIN INSULATORS • FIBRE PIPE & CONDUIT



THESE TYPICAL VOLTMETER CHARTS show what happened when an SRT Transformer replaced a conventional transformer at an industrial load. The black line shows typical voltage variations with the conventional transformer, the blue line, which has been superimposed for comparison, shows the typical voltage with the SRT. Note the former steady voltage drop after 7 A.M., and the way voltage was levelled out by the SRT Transformer. With the conventional transformer, voltage ranged from a low of 108 volts to a high of 120. In comparison, note the uniformity of the voltage with the SRT Transformer. This enabled the utility to realize a substantial increased annual revenue, which much more than covered the added cost of the SRT Transformer.

SRT® Transformers Pay Own Cost With $1 Per Kva Increased Annual Revenue

L-M SRT Transformers provide consistently good voltage at utilization point; maximize revenue.

by **A. R. Waehner**
Director of Transformer Product Sales
Line Material Industries

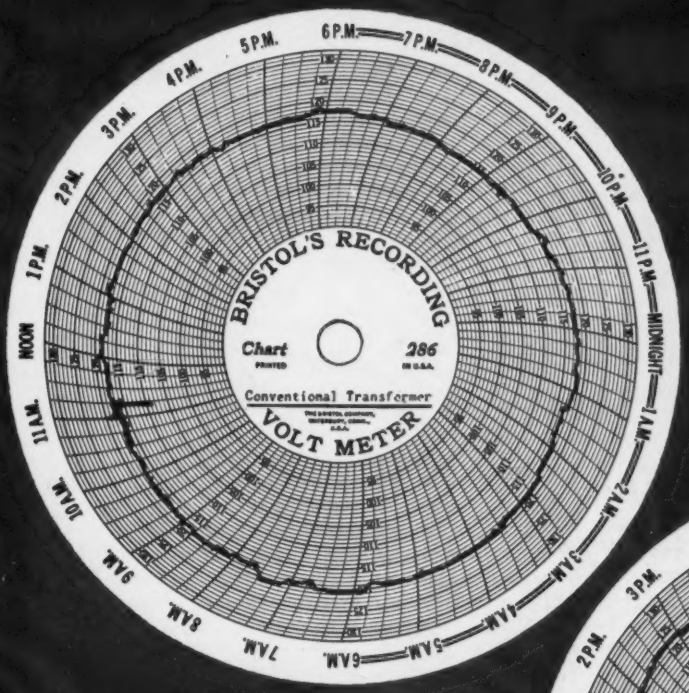
L-M Self-Regulating Transformers provide the ideal way to keep utilization voltage at the optimum level. As load varies, the SRT changes tap positions automatically to assure a regulated secondary output of 123 volts. The electronically controlled self-regulating mechanism assures optimum voltage at all times, with a conservative increase in annual revenue of $1 per kva of nameplate rating. Thus a 25 kva SRT Transformer increases revenue about $25 a year, $50 for a 50 kva, and so on. The increased revenue alone more than covers the cost of the SRT service.

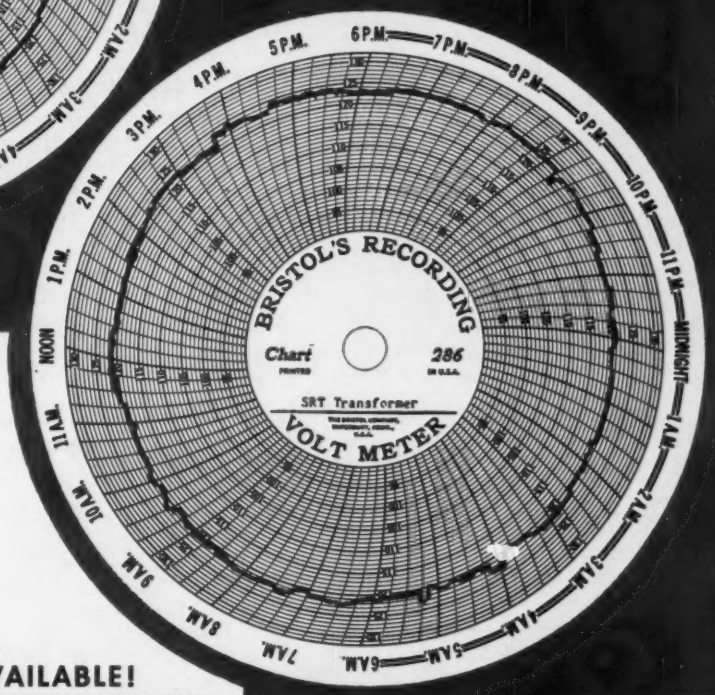
Thus, over and above the customer satisfaction and good will produced by the better service provided, the L-M SRT Transformer pays for itself in actual dollars returned to the utility.

Economic parameters vary in each utility. L-M has programmed its computer to assist you to evaluate the economic benefits of SRT based on your own values. Bulletin No. 61144 (available on request) provides you with an easy means to submit your data. Using your parameters, we will compute the dollar savings SRT Transformers can earn for you.

Dollar savings were calculated on the basis of the following assumptions:

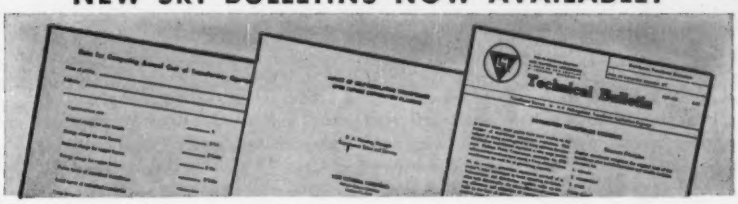
1. **an annual peak load on each self-regulating transformer equal to 150 percent of nameplate kva**
2. **load factor of 35 percent**
3. **power factor of 85 percent**
4. **each two-percent increase in voltage increases kwhr consumption one percent**
5. **each additional kwhr sold increases net revenue one cent**





TYPICAL VOLTAGE CHARTS before, and after, an SRT Transformer was installed at a location serving both commercial and residential customers. Both transformers were 50 kva units. Note that the average voltage was increased. The SRT particularly corrected the typical evening voltage sag from 7 to 10 P.M., when voltage formerly dropped as low as 114 volts. Peak loads were as high as 65 kva on both transformers. The voltage improvement by the SRT Transformer was as much as 12%. This voltage improvement resulted in an average annual revenue increase which more than justified the cost of the SRT Transformer.

NEW SRT BULLETINS NOW AVAILABLE!



Ask your L-M Field Engineer, or write L-M, for copies of these bulletins:

- **No. 61144: Data Form For Computing Annual Savings**
- **No. 61046: Impact of Self-Regulating Transformer on Future Distribution Planning, by D. A. Manning**
- **No. TDT-110: Distribution Transformer Economics, by H. Hollingshead**

Line Material Industries, Milwaukee 1, Wisconsin.

OUR 50TH YEAR 1911 — 1961

LINE MATERIAL® Industries

McGRAW-EDISON COMPANY

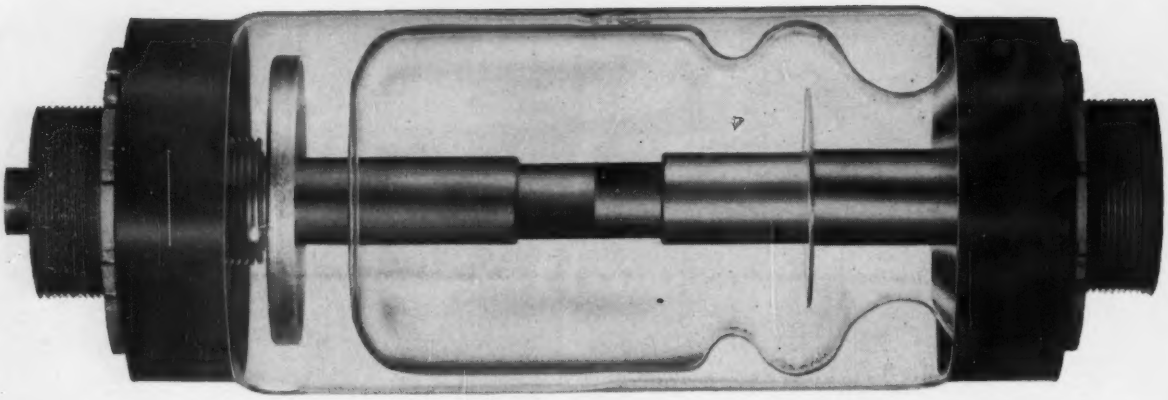
Transformers

McGRAW EDISON

'326

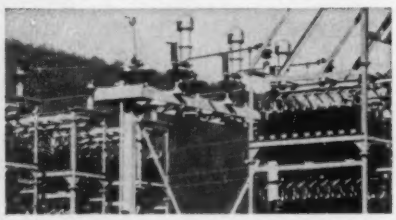
DISTRIBUTION TRANSFORMERS · RECLOSERS, SECTIONALIZERS AND OIL SWITCHES
FUSE CUTOUTS AND FUSE LINKS · LIGHTNING ARRESTERS · POWER SWITCHING EQUIPMENT
PACKAGED SUBSTATIONS · CAPACITORS · REGULATORS · OUTDOOR LIGHTING
LINE CONSTRUCTION MATERIALS · PORCELAIN INSULATORS · FIBRE PIPE AND CONDUIT

WITH THE NEW ELECTRONIC CONTROL, the SRT Transformer offers even greater flexibility and accuracy. The external control is easily accessible. Band midpoint is accurately adjustable from 120 to 126 volts.



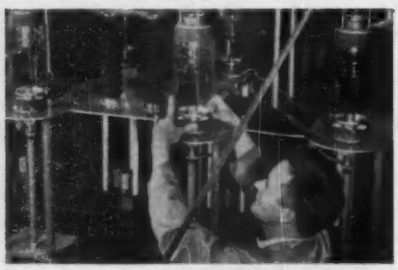
HOW TO SOLVE HIGH VOLTAGE SWITCHING PROBLEMS

Basic Ingredient: Jennings Vacuum Switches



Bank-to-bank capacitor switching with Hi Voltage-Joslyn 34.5 kv Heavy Duty Vac-Rupters® utilizing Jennings Vacuum Power Switches as the interrupting element.

Schwager Wood Corp. switchgear utilizing Jennings Vacuum Power Switches at work in this 230 kv line and load dropping application.



Testing Vacuum Power Switches at full rated voltage and load current in Jennings high voltage laboratory.

Jennings Vacuum Switches were introduced over thirteen years ago; the first practical vacuum switches ever developed. Here are some of the reasons why this revolutionary breakthrough continues to solve more and more high voltage problems better than other switches.

FIRST: Because vacuum is the strongest dielectric known. Its high strength offers such rapid recovery of high dielectric strength on current interruption that less than ½ cycle of arcing occurs after contact separation.

Positive current interruption occurs at the first current zero after contact separation with no restrikes.

Vacuum contacts require no more than ¼" separation in a very small enclosure permitting the use of fast lightweight actuating mechanisms.

SECOND: Jennings 19 years experience in non-thermionic vacuum devices has resulted in the development of exclusive processing techniques that produce the most complete vacuum obtainable, supported by maximum effective purity of working parts. The result is a permanent dielectric that requires no maintenance.

THIRD: As a further assurance of quality unusually complete test facilities are available to duplicate actual operating conditions. Every switch delivered is first put through 100 operations under load to determine its reliability. The test results provide the ultimate user with the highest possible insurance that the vacuum switch is more than capable of performing to its ratings.

FOURTH: Hundreds of successful applications in the utility power switching field prove conclusively the reliability and effectiveness of Jennings Vacuum Switches.

Jennings policy is to specialize only in the design and production of the finest vacuum switches available. The complete switchgear equipment, utilizing Jennings Vacuum Switches, may be obtained from leading switchgear manufacturers and offers all the advantages of vacuum switches, plus the unique capabilities of their own switchgear design. This combination is unsurpassed for such applications as capacitor switching, load break switching, fault current interruption, transformer magnetizing current, inductive switching, and high voltage transformer line dropping.

Specify Jennings Vacuum Switches for your next high voltage application. In the meantime, write for more detailed information on Jennings switches for high power utility use, and a list of switchgear manufacturers utilizing Jennings Vacuum Switches in the complete switchgear equipment.

RELIABILITY MEANS VACUUM | **VACUUM** *MEANS* Jennings®

JENNINGS RADIO MFG. CORP., 970 McLAUGHLIN AVE., SAN JOSE 8, CALIF., PHONE CYpress 2-4025

UNI/DYNE TURRET™ giant in strength, compact in size, exclusive with PITMAN

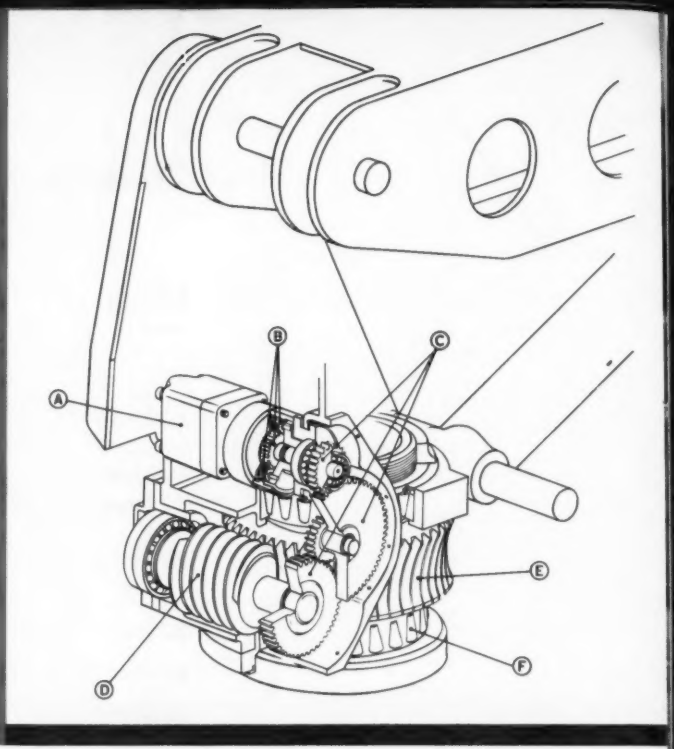
Now—out of the same dynamic atmosphere which produced the famous Pitman Polecat—comes an utterly new concept in creative engineering . . . the Uni/Dyne Turret, now provided as standard equipment on all Polecat models.

Pitman engineered the Uni/Dyne Turret to meet the ever-increasing list of job requirements for lifting and digging equipment and to provide the industry's standard for years to come. For the first time, a rotation system has been designed specifically for the job to be done. It obsoletes all competitive equipment.

Uni/Dyne Turret is extremely compact, enables Polecat unit to be mounted virtually *anywhere* on a utility line truck—new or in-use. Rotation gear system and hydraulic motor to run it are completely contained within the turret—there are no chains, sprockets, exposed gears, cables, or other compromises. Rotation locks instantly when power is removed, provides rigid base of operations.

Pitman Polecats, with exclusive Uni/Dyne Turret, are available in center-mount, corner-mount and top-mount models, and new top-mount model with operator seat. Turn this page for details.

TM



Note the clean, uncluttered design of Pitman's Uni/Dyne Turret! There are no exposed hydraulic hoses to snag. The turret-housing is a stress-relieved steel casting, which provides additional metal at points of strain. With all of its strength, Uni/Dyne is more compact than other turrets on the market; it installs even on a corner-mount, which requires only 14" of space. Its maximum over-all height is only 32". Uni/Dyne rotates 375° in either direction. Entire rotation system is enclosed, and operates in a bath of oil.

Hydraulic motor (A) operates planetary gear system (B), driving spur gear train (C), which turns worm (D) around main worm gear (E), providing rotation of entire unit. Tapered roller bearings (F) provide maximum load-carrying capabilities. Worm and worm gear lock instantly in case of power loss, preventing any boom rotation until power is re-applied; this self-locking rotation mechanism provides a rigid base for digging under tough conditions . . . lifting heavy loads precisely . . . raising men and tools aloft.

NOW, ALL POLECAT™ MODELS FEATURE

UNI/DYNE TURRET™ BY PITMAN

. . . leader in development of new hydraulic lifting and digging equipment

Uni/Dyne is standard equipment on all corner-mount, center-mount and top-mount Pitman Polecats. If you'd like to see one, your Pitman Utility Dealer will be glad to oblige with a thorough demonstration. Or, simply contact . . .

PITMAN MANUFACTURING COMPANY

12718 PITMAN ROAD • GRANDVIEW, MISSOURI • TELEPHONE SOuth 1-1851

PITMAN MANUFACTURING (CANADA), LTD., TORONTO

Electrical World

AUGUST 28, 1961
Vol. 156, No. 9

Preview of the Issue

DEPARTMENTS

Editorial Comment..... 35
Dateline 3
Letters 5
Electrical Week..... 22
Supply Lines..... 23
News Scope..... 36
Today's Design Trends.. 49
EUM 51
New Equipment..... 53
Manufacturers News.....105
Selling 108
Management Newsletter..113
News About People.....117
Meetings Calendar.....124
Advertising Index.....124

- **DOUBLE-DUTY POLES cut underground cost for Oregon subdivision..... 45**
- **LONG SERVICE LIFE is displayed by turbine lube oils that last up to 175,000 hours..... 46**
- **PRE-FAB CONCRETE TRENCH guards primary-voltage conductors..... 47**
- **ELECTRIC UTILITY METHODS report beginning on page 51 features:**
  - **Balloons 'air-lift' pulling lines across turbulent Japanese straits..... 65**
  - **Cold-trap permits transformer 'dry-out' in the field..... 66**
  - **Stadia target allows for temperature changes during sagging..... 68**

CURRENT EVENTS

NEW AIEE PRESIDENT Warren Chase examines the Institute in an exclusive EW interview. What are the two key problems he feels AIEE faces?..... 40

DATELINE

BIG DRIVE to soften up federal power advocates' path appears imminent..... 3

INTERNATIONAL

LATIN AMERICAN CONFERENCE faces up to the task of tripling electricity supply in ten years..... 42

HIGH-VOLTAGE, DC SUBMARINE PROJECT moves ahead in New Zealand . . . Britain's CEGB may defer nuclear power station if steam generating station is okayed..... 38

MANAGEMENT

UP AND OVERBOARD? The economy has been lifted out of the recession, but many are worrying that government spending may lead to inflation..... 113

BE SURE TO SEE new, graphic presentation of the EBO statistics..... 116

NEW BUY-AMERICAN DISPUTE appears in the offing as Allis-Chalmers levels charges at Baldwin-Lima-Hamilton..... 23

MANUFACTURERS NEWS

DIGITAL DISPATCH COMPUTER ties high-speed analog control elements with process digital computer to assign electric load generation..... 105

MEETINGS

SPURRING INTEREST in nuclear science, Texas utilities sponsor program of symposiums aimed at high school students and teachers..... 44

POLITICS

STALEMATE: Senate-House conferees' first try for a Hanford compromise fails.... 36

ADVOCATES of water resources council tell Senate committee they really prefer a broader unit; opponents score federal intrusion..... 37

HYDRO LICENSE REVIEW is urged by Sen Metcalf, who suggests tying license renewals or cancellations to power companies' stands on Hanford..... 39

SELLING

BILLBOARD ADS are used by Ohio utility to announce rate cut. Lowered rate is seen as an incentive for total-electric homes..... 108

TODAY'S DESIGN TRENDS

SYNCHRONOUS GENERATOR can use harmonic voltage output for excitation. Safe, reliable system uses silicon rectifiers for dc conversion..... 49

NEXT WEEK

VOLTAGE CONTROL is improved by four-step capacitor switching.

LATE NEWS ▸ **Colorado-Ute Electric Assn hopes to build 150-Mw steam plant** on Colorado coal fields and sell 100 Mw to Salt River Project via proposed federal Colorado River Storage Project lines. Exchange of letters between groups confirms in-principle agreement. Colorado-Ute avers REA approval for loan to build plant, contingent upon Bureau of Reclamation approval.

Proposed tax incentive for business spending on machinery and equipment—from which electric utilities would be barred—is on the shelf until next year. Proposal, tentatively approved by House Ways & Means Committee (EW, July 31, p 25), would have allowed 8% credit on taxes for equipment investment.

Moon Lake Electric Assn, Vernal, Utah, is granted $3,299,000 loan by REA, part of which goes toward purchase of Uintah Power & Light Co. This is first REA loan to buy out a company. Loan will re-finance short-term loan previously made to Moon Lake by Nationwide Insurance Co and several nearby co-ops for purpose of buying out Uintah. In 1958 Moon Lake raised eyebrows by borrowing $4,246,000 from REA to build 35-mile, 115-kv line to supply power to Flaming Gorge construction camp—capacity of the line being several times that needed either for the camp or for Moon Lake's own needs (EW, July 14, 1958, p 46).

Southwest Power Pool seeks exchange of seasonal surpluses with TVA. J. Robert Welsh, Southwestern Electric Power, chairman of the Pool's executive committee, says 1,500 Mw could be swapped for SPP's summer and TVA's winter peaks.

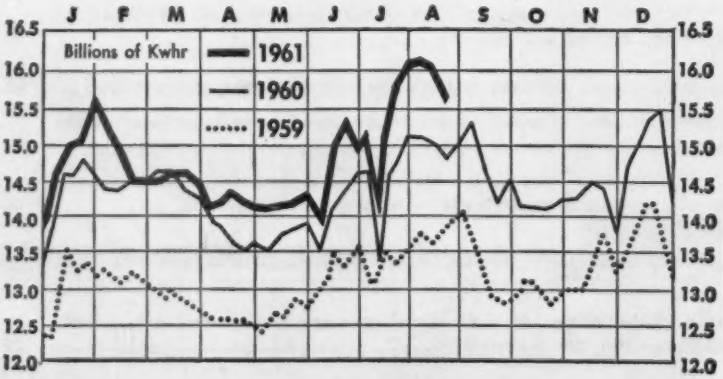
Beloyarsk nuclear power station in Urals will be world's first with nuclear superheat, Russian newspaper Ekonomicheskaya Gazetta claims in report noting that construction is "nearing end." Project chief engineer B. Ivanov quotes plant characteristics which generally jibe with those published in 1959 through International Atomic Energy Agency. One new figure claims full-capacity operation for 750 days without refueling, or a burnup approaching 60,000 Mw-days per metric ton of uranium fuel.

Jersey Central Power & Light Co files declaration of intent with the Federal Power Commission to build 300-Mw pumped storage power project on Yards Creek in Warren County, N.J. Project calls for 55-ft earthfill dam about 1,300 ft long with storage capacity of 4,650 acre-ft (EW, Oct. 31, 1960, p 48).

Allis-Chalmers announces that it is not going to raise regulator prices. Move is apparently in response to General Electric and Westinghouse announcements (EW, Aug. 21, p 24) of 5% price increases on voltage regulators.

WEEKLY POWER OUTPUT—Up 5.4%

(Week Ending Aug. 19), Kwhr 15,665,000,000



Per Cent Change From Previous Year

	Aug. 5	Aug. 12	Aug. 19
Total U.S. (R)*	+ 6.7	+ 6.9	+ 5.4
New Eng.	+ 5.4	+ 9.7	+ 4.6
Mid. Atlan.	+ 6.2	+ 9.6	+ 4.6
Cent. Ind.	+ 6.6	+ 5.1	+ 4.0
West Cent.	+13.0	+10.2	+ 8.9
Southeast (R)*	+ 6.7	+ 5.1	+ 3.0
South Cent.	+ 2.9	+ 6.9	+11.7
Rocky Mount.	+ 5.2	+ 7.4	+ 5.8
Pacific NW	+ 5.9	+ 3.9	+ 2.5
Pacific SW	+ 9.6	+10.1	+ 8.3

Seasonally Adjusted Index 286

Week Ago 293 Year Ago 272

Source: Edison Electric Institute

* Revised

Supply Lines

TURBINE-BID PROTEST MAY RENEW 'BUY AMERICAN' CONTROVERSY

A new Buy-American controversy appears to be in the offing, this time involving two US manufacturers of hydraulic turbines. Allis-Chalmers Manufacturing Co has filed a protest with the Corps of Engineers charging that the apparent low bid submitted by Baldwin-Lima-Hamilton Corp for thirteen 212,400-hp turbines for John Day and Lower Monumental Dams in Washington was "inaccurate and misleading" about the amount of foreign manufacture involved.

At the same time, A-C appealed the bid on the basis of the effect foreign manufacture would have on the domestic unemployment situation. And finally, the company brought up the question of national security and defense and asked that the matter be referred to the Office of Civil and Defense Mobilization.

In the bidding July 27 at Walla Walla, B-L-H was low at $15,486,900. A-C was second at $18,035,510. B-L-H says in its bid that 42.7% of it will be applicable to foreign (in this case Japanese) procurement. Allis-Chalmers disagrees, and, based on studies it says it has made on the foreign work involved, thinks that B-L-H's foreign sourcing will amount to 71% of the bid. Looked at another way, A-C says, a different study of the domestic work involved shows that only 33.7% of the bid would involve domestic work. Therefore, A-C concludes, "We submit that the Baldwin-Lima-Hamilton statement that 53.4% of their bid would be supplied from domestic sources is inaccurate and therefore nonconforming under your requirement 'Bids must set forth full, accurate, and complete information as required by this Invitation for Bids . . .'"

This controversy brings to mind a somewhat similar one two years ago over the Glen Canyon Dam turbines when English Electric Corp unsuccessfully sought to have B-L-H's low bid classified as a foreign bid under the Buy American Act because, according to EE's reckoning, more than 50% (and not 47%, as B-L-H contended) of the bid involved foreign sourcing. The General Accounting Office ruled in favor of B-L-H, which was given the contract by the Bureau of Reclamation. There, the key issue was the interpretation of the wording of the regulation which defines what portions of the work can be considered foreign and domestic.

In the present case, A-C is not trying to get B-L-H classified as a foreign bidder, for in that event B-L-H would still be low even after adding a 12% differential under the Buy American Act. Instead, A-C wants B-L-H's bid to be thrown out. The wording of the Corps' defining clause says that a "domestic bid means a bid . . . for a domestic source end product, including transportation to destination . . . Domestic source end product . . . means an end product manufactured in the US if the cost of its components which are . . . manufactured in the US exceeds 50% of the cost of all its components."

On the question of employment, Allis-Chalmers contends that 1,532,000 man-hours "would be lost to American labor" if B-L-H gets the bid and goes ahead with its plan to subcontract a portion of the work to Japanese manufacturers.

On the question of national security, A-C says the hydro projects "represent important sources of electricity which will be vital to our nation. In view of the current tense international situation, it seems imprudent to enter into a contract which involves the manufacture of so much essential equipment in a country where only recently civil uprisings forced the cancellation of a state visit by our President, and which is 4,900 miles away across an ocean from the delivery point."

While not protesting directly to OCDM, A-C asked that the matter be referred

there if it does not get the contract. OCDM ruled in 1959 that imports of hydraulic turbines were not a threat to national security but suggested that the matter be "reviewed from time to time." Such reviews have been made periodically, but apparently the picture has not changed in OCDM's eyes during the past two years.

In Walla Walla, the Corps made no comment when it received the protest other than that it would be evaluated along with the bids. This evaluation is due in about a month.

In Philadelphia, B-L-H President William S. Ginn denied A-C's charges of inaccuracy in the bids and said he hoped OCDM would change its mind and rule that turbine imports are a security threat. But in the meantime, he would have to rely on foreign sourcing to make his company competitive in the turbine market.

LATIN AMERICAN MANUFACTURERS FACE FINANCING PROBLEMS

Latin American electrical equipment manufacturers, like US manufacturers, have their problems, and a new one was focused on at the recent Latin American Electric Power Seminar held in Mexico City (see p 42). Traditionally, the Latin American utility market has been a highly competitive one with US, European, and Japanese electrical manufacturers bidding for the business.

But two recent elements are changing the picture. One is the rise of domestic electric equipment manufacturing in the area, particularly in Mexico, Argentina, Chile, and Brazil. These ventures are often tied in financially with established European and US manufacturers. The second element is the increasing importance of credit offered to the Latin American buyers by the foreign sellers. Sometimes, this financing period is up to ten years.

Latin American manufacturers can't offer this much credit, at least not without some sort of backing, and up to now, lending agencies such as the World Bank have granted loans only for the foreign currency (i.e. European) portion of the project. But at the Seminar, a World Bank delegate explained that his institution has started financing local equipment acquisitions in some cases. How much this will help the local manufacturers remains to be seen.

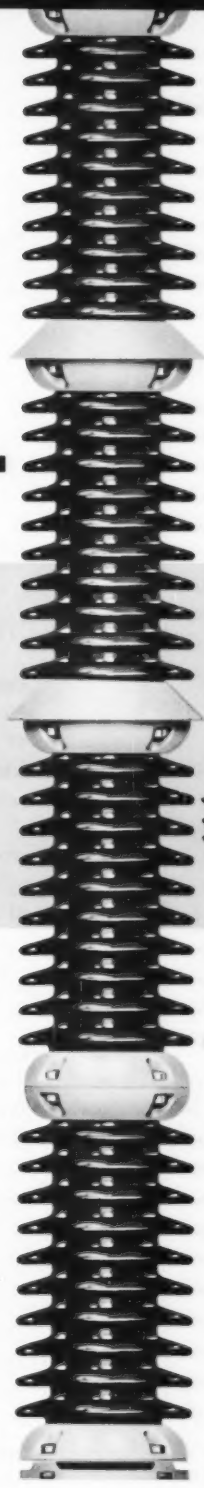
FPC REPORTS ON UTILITY FUEL CONSUMPTION IN MAY

Total fuel consumption by electric utilities in May was 21.4 million equivalent coal tons, an increase of 3.8% over the preceding May compared with an increase of 4.9% in kwhr generation by fossil fuels, the Federal Power Commission reports.

Coal consumption was 13,788,355 tons, an increase of 3.1% over the 13,378,121 tons consumed in May 1960. Gas consumption was 156,331,384,000 cu ft, an increase of 3.0% over the 151,723,045,000 cu ft burned in May 1960; oil consumption was 5,609,357 barrels, an increase of 11.2% over the 5,046,363 barrels consumed in May 1960.

Coal stocks on hand at electric utility plants on June 1 totaled 48.5 million tons, about the same as a year ago. This is sufficient to last 109 days, based on the May rate of consumption, compared with 112 days a year earlier. Fuel oil stocks totaled 18.9 milllion barrels compared to 15.8 million barrels a year ago. This is sufficient to last 105 days, based on the May rate of consumption, compared to 97 days a year ago.

If you buy POSTS for your station...



Check these O-B features; you'll find stations easier to design whatever the voltage

Here are big advantages you get with O-B POSTS:

- Full range of BIL ratings
- Three strengths
- Electrical characteristics exceeding ASA requirements
- Dimensions of ASA standards where applicable
- Interchangeable units in stacking post
- Greater stability in broad base of stacking post
- Effective, easy-to-install rainsheds for stacking posts
- Stacking post units that serve multiple BIL ratings

If you've designed stations using O-B posts, you'll recognize the value of many of these features. And, we're sure you would agree O-B furnishes you with an insulator that is easy to use, that will do more than a minimum job, and that will provide long-time dependability.

If you've not designed a station using O-B posts, we would suggest that you talk to your O-B representative and get acquainted with these features.

OHIO BRASS COMPANY, MANSFIELD, OHIO
Canadian Ohio Brass Co., Ltd., Niagara Falls, Ont.

Ohio Brass HOLAN

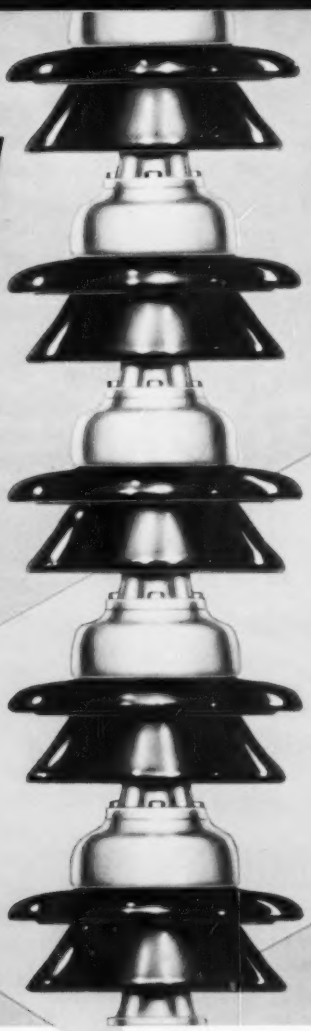
PORCELAIN INSULATORS · LINE HARDWARE · CAPACITORS · LIGHTNING ARRESTERS
BUSHINGS · HOLAN TRUCK-MOUNTED POWER DEVICES AND BODIES · BRONZE VALVES

10112-H

There is another side to our story... for PINCAPS

SEE NEXT PAGE

If you buy PINCAPS for your station...



Choose from O-B's complete range of pincaps from 7.5 kv into EHV

Pincap station insulation is the "traditional" design with which O-B has more than 50 years of production experience. The consistent, outstanding performance of the O-B pincap is another tradition. That is one reason O-B devotes so much time to research, design, and product application for the industry's rising voltage levels.

With O-B pincap station insulation, you can easily select an insulator or combination for all system voltages from 7.5 kv up into the extra high voltage range. Where national standards apply, O-B pincaps not only conform but exceed minimum requirements.

These switch and bus pincap insulators of the single unit design include all ratings up through 250-kv BIL in two strengths. Stacking units begin at 350-kv BIL and are generally composed of identical units. Where higher strength, high voltage stacks are needed, mixed stacks increase considerably the cantilever strength.

Your O-B representative will be glad to give you full information on O-B's station pincaps. Just ask.

OHIO BRASS COMPANY, MANSFIELD, OHIO

Canadian Ohio Brass Co., Ltd., Niagara Falls, Ont.

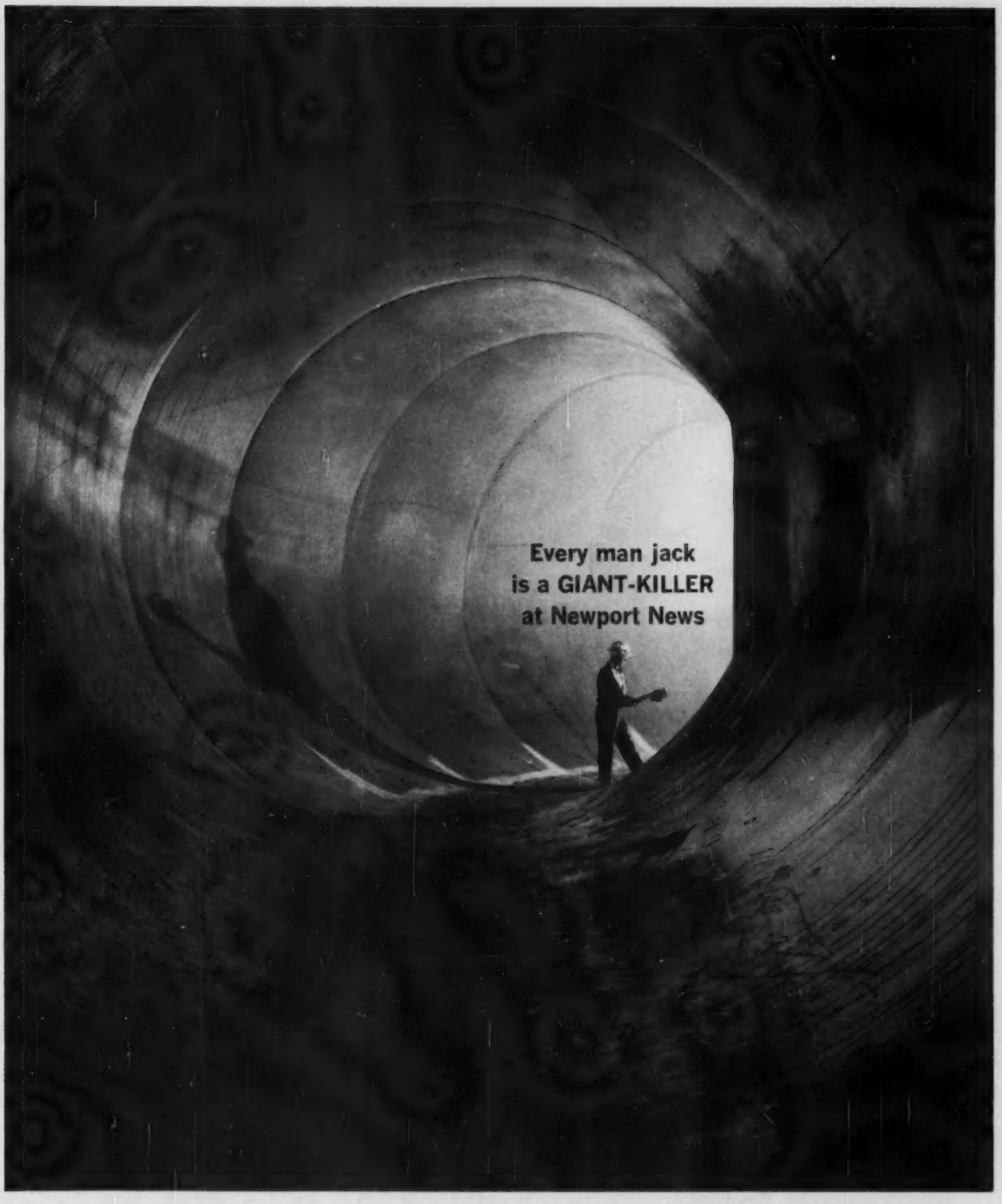
Be sure to check the other side of our story... for POSTS

SEE OTHER SIDE

Ohio Brass (B) HOLAN

PORCELAIN INSULATORS · LINE HARDWARE · CAPACITORS · LIGHTNING ARRESTERS
BUSHINGS · HOLAN TRUCK-MOUNTED POWER DEVICES AND BODIES · BRONZE VALVES

10112-H2

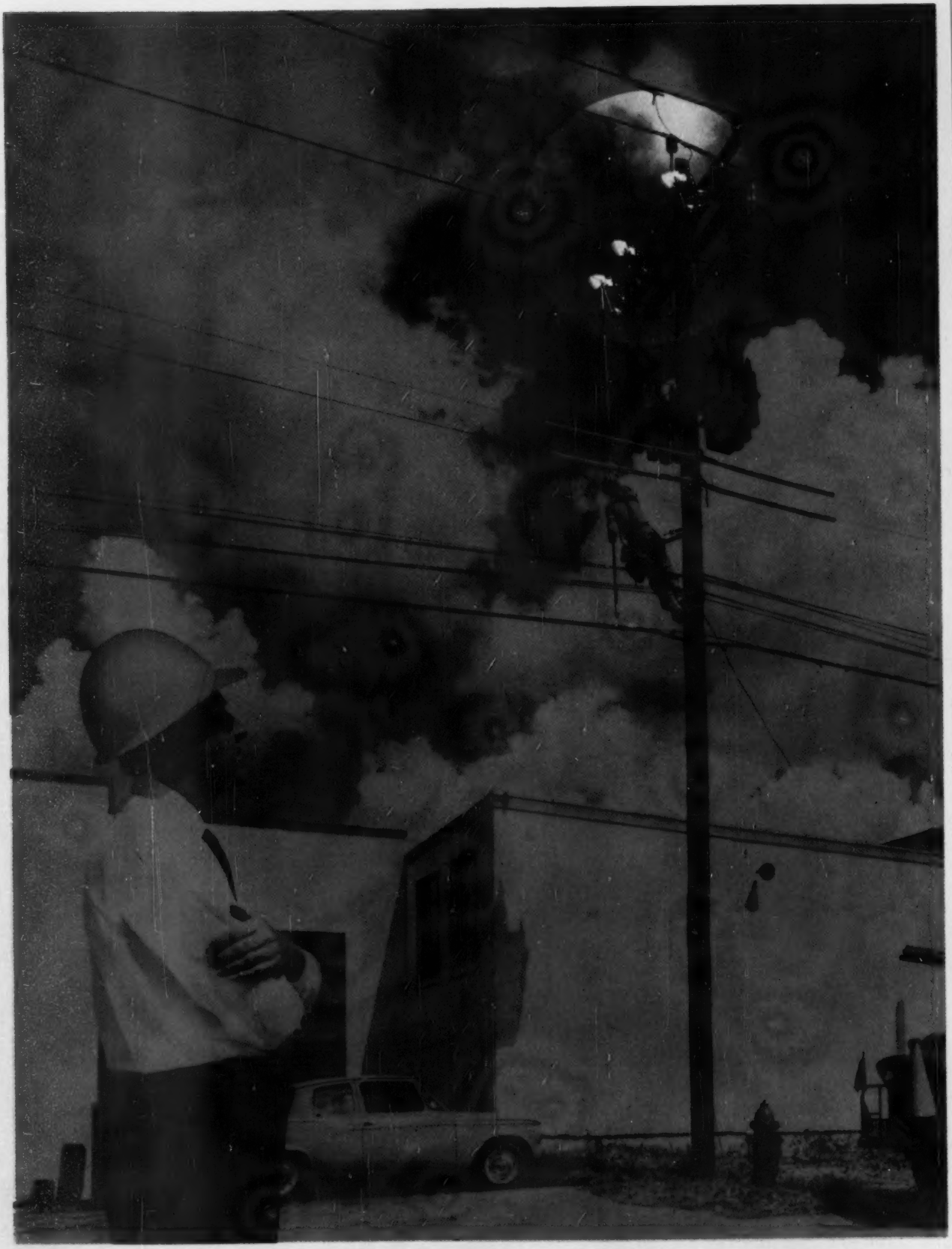


This huge hydraulic turbine casing dwarfs the workman—but to him and 15,000 others at Newport News, tremendous jobs such as this are routine.

Here giant engineering and production challenges are conquered in stride. Turbines, valves, gates and penstocks for the greatest hydroelectric projects—Niagara, Grand Coulee, Hoover and 96 others. Pressure vessels and similar heavy equipment for the petrochemical industry. Paper dryer rolls, wind tunnels, bridge caissons—almost any job that calls for heavy steel fabrication and machining of massive parts to close tolerances.

Whatever your project, call on Newport News. It has the men, methods and machines to accept the toughest challenge.

Newport News
SHIPBUILDING AND DRY DOCK COMPANY
NEWPORT NEWS, VIRGINIA



New Westinghouse LBU Loadbreak. Test Operation photo, made on lines of Houston Lighting and Power Company.

When the Westinghouse LBU Loadbreak was tested, the line appeared to be dead!

There was no noise, no visible gas . . . but the line *wasn't* dead! If you test this loadbreak in daylight, you might not see the arc flash . . . and you, too, may think you have opened a cutout on a dead line. Just pull it open . . . and the new Westinghouse LBU simply and safely breaks up to 200 amperes.

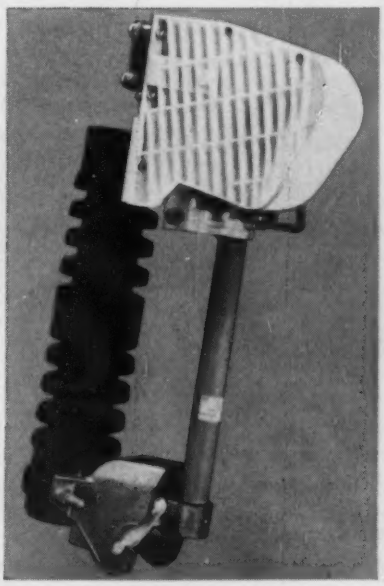
NO MAINTENANCE—The LBU operates without special loadbreak attachments. There is no fuse link or other parts to replace after operation. Just open it, with a standard hookstick, and load is interrupted. Close it, and service is restored.

EXCLUSIVE DOUBLE-DUTY DESIGN—Only Westinghouse has this new arc-chute design, made possible by development of a new acetal resin that has exceptional non-tracking quality. The LBU is both a 200 ampere loadbreak and a 100 ampere open fuse cutout with fault interruption ability to 16,000 amperes at 15 kv.

SAFE AND RELIABLE—The arc is confined within the chute. There is no chance of external arcing. When the blade is released, a de-ionizing gas is generated from the acetal resin by the arc heat. The LBU's loadbreak operation is unaffected by rain, sleet, snow or ice. After 200 laboratory operations at full interrupting rating of 200 amperes, the LBU arc-chute showed only negligible wear.

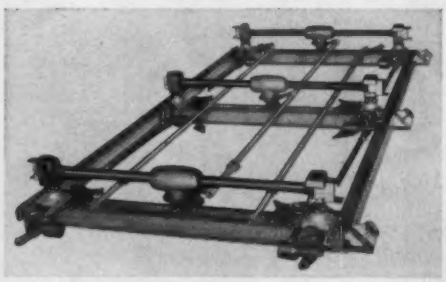
A NEW CUTOUT, TOO—The LDX (not shown) is a new Westinghouse Open Fuse Cutout. It has the same new nonferrous design as the LBU, without the loadbreak feature. Both the heavy-duty and extra-heavy-duty classifications are available in either 7.8 or 15 kv ratings.

For complete information, call your Westinghouse Sales Engineer. Or, write Westinghouse Electric Corporation, P.O. Box 868, Pittsburgh 30, Pa. *You can be sure . . . if it's Westinghouse.* J-65002

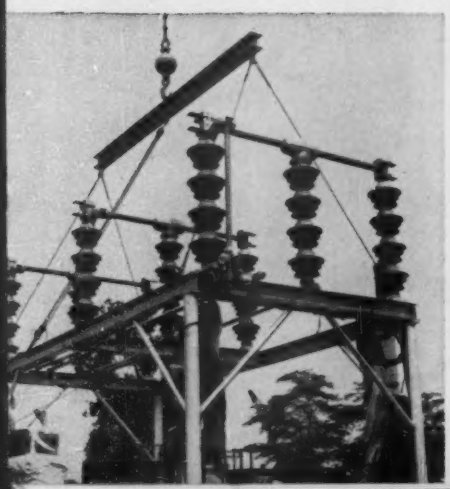


Westinghouse

Above is a partial view of the Ravenswood Substation showing some of the switches in place on the aluminum stands. In all, there are 54 disconnect switch structures as well as a variety of structures for bus supports, lightning arresters, coupling capacitors and wave traps, cable potheads, and potential transformers.



Preassembled welded aluminum switch structure as it arrived from the factory. Switch bases are integral with frame. Grounding switches and their interphase rods were also factory installed in many cases.



The photograph at left shows the special sling used to lift the switch package into position on the leg sections. The columns for a typical stand were installed in approximately 10 minutes; insulators were installed in a little over an hour, and the switch lifted and bolted into position in less than 15 minutes.

RAVENSWOOD GOING UP...

A NEW CONCEPT IN SUBSTATION DESIGN AND CONSTRUCTION

Ravenswood transmission substation which serves Con Edison's big new generating plant along the East River in Long Island City, New York, is going up smoothly and quickly. One of the major factors contributing to the speed and ease of its erection is a bold new concept in substation design and construction: factory preassembly of switch structures.

The original idea for these packaged structures came about as a need voiced by Con Edison's engineers. Working with them on the project, Southern States' Structural Engineering Department conceived a practical design permitting much assembly work normally accomplished in the field to be done at the factory.

Ravenswood, the world's largest aluminum transmission substation, was the first practical application for this concept. When construction started, these compact, easily handled units were in the field ready for installation. They consisted of completely assembled welded aluminum frames with integral switch bases, interphase rods, and components of the switch mounted in position. By simply removing the switch live parts and reassembling with insulators, the packaged structures, with switches already adjusted, were ready for installation. In addition, factory fabricated aluminum stands further reduced the number of hours required to get a switch installed.

Some of the advantages of this approach are readily apparent. Contrast the handling required for these factory assembled switch structures to the conventional method of shipping all pole units separately. Further, in usual practice, all interphase rods, clevises, adjustable arms, grounding shunts, and numerous nuts and bolts are unassembled when they arrive at the job site. As construction engineers will confirm, a lot of valuable time is spent sorting and preparing such switches for mounting. And once the switches are in place on their stands, interphase rods have to be installed and the switch completely adjusted for proper opening and closing. (The packaged units require only a minor adjustment of tilting rings after the switch is installed.)

According to Con Edison, savings at Ravenswood are significant.

Although the use of aluminum structures and aluminum stands as employed on this station may not be practical in some areas and for some utilities, the principle involved may represent a real breakthrough in substation construction. For example, the basic idea could be easily applied with factory assembled, bolted steel sections for mounting on any type of stand whether aluminum, steel column, or conventional structure.

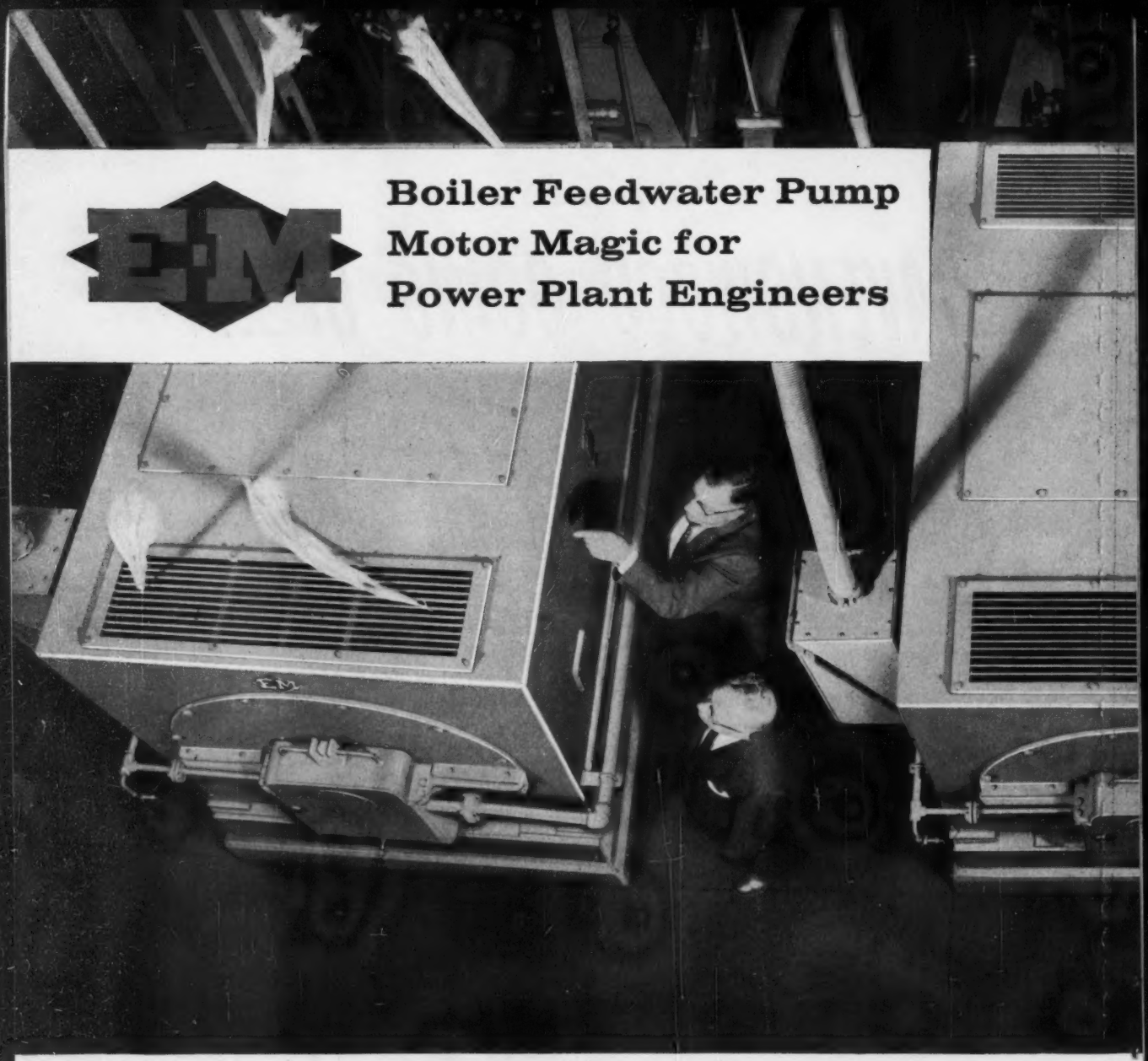
With labor costs skyrocketing, serious consideration should be given to the practicability of factory preassembly of switch structures for your next substation.

Why not discuss this new idea with your Southern States representative or contact us direct for additional information?

SOUTHERN STATES

HAMPTON, GEORGIA

IN CANADA: DOMINION CUTOUT CO., LTD., TORONTO



Boiler Feedwater Pump Motor Magic for Power Plant Engineers

Shown above are three E-M Straight-Up-Ventilated Squirrel-Cage Induction Motors driving boiler feedwater pumps at High Bridge Station, Northern States Power Company, St. Paul, Minnesota. Each motor is rated at 2500 hp, 3600 rpm,

Straight-Up Ventilation Gives

The space-saving secret is in the natural air-flow design of E-M's Straight-Up-Ventilated Motors.

With straight-up ventilation, each motor takes in cool, clean air from both sides near floor level, circulates it in and around all operating components. The warm air is then discharged *through the top* of the motor housing. Natural convection carries it up and away where it can't heat up adjacent motors.

Thus cross-circulation and recirculation are effectively halted. Each motor has its own exclusive "convection stack" which permits compact installation with cool operation.

But that's not all. There's more magic in these E-M Motors:

GREATER OPERATOR COMFORT. No more hot blasts at face level. Since heated air from the top discharge rises straight to the ceiling, the usual warm air buildup at operator level is eliminated.

QUIET OPERATION. Aerodynamically sloped stator blowers and labyrinth air passages are among the

2300 volts. O. W. Johnson, plant superintendent, and C. H. White, assistant plant superintendent, are discussing advantages of straight-up ventilation of machine at left. Air-flow is indicated by paper streamers temporarily attached to discharge louver.

You a Compact Installation!

acoustical control features which help to minimize windage noise. The motor is not dead silent . . . just remarkably hushed.

EASY MAINTENANCE. Access panels and bearing caps are easily removed by one man without use of crane or lifting device. Permits quick inspection of coils, stator core, bearings.

And, of course, you still get the same premium materials and hand-crafted construction that has made E-M quality famous for over 60 years.

See how the magic of E-M Straight-Up-Ventilated Motors can solve *your* boiler feedwater pump power problems. Call your nearby E-M Field Engineer and write to the factory for your copy of brochure No. 1134.

ELECTRIC MACHINERY MFG. COMPANY
Minneapolis 13, Minnesota

E300-TPA-2210

ALLIS-CHALMERS

A-1462

ALL-NEW

ENDUR-ALL

DISTRIBUTION TRANSFORMERS

New ENDURING VALUES DELIVER MORE FOR YOUR TRANSFORMER DOLLAR!

New! More overload capabilities with greater cooling duct area, lower temperature gradient.

New! Even more overload capabilities with high-temperature insulated wire.

New! Still more overload capabilities with high-temperature oil.

New! As much as 25% lower impedance. Less voltage drop under higher overloads — permits full utilization of the greater overload capacity.

New! High short-circuit strength with automatic compression and locking of end-frame assembly.

New! 32 potential trouble-makers eliminated in core-and-coil end-frame assembly. No nuts, bolts, washers to lose, no welds to break.

New! Easier to handle and hang — units are 10% smaller and lighter.

New! High-gloss appearance and longer retention life with 3 baked-on paint coats.

New! Improved seal — nonaging, nonsetting gasketing.

New! Series-multiple switch — for lower changeover cost when making distribution voltage conversion.

New! Uprated *Thermalite* overload indicator — extra safety factor. Spots dangerous overloads from the ground.

for more details

CALL, WRITE OR WIRE . . .

Allis-Chalmers,
Power Equipment Division,
Milwaukee 1, Wisconsin

ENDUR-ALL and Thermalite are Allis-Chalmers trademarks.

Planners Must Answer the Question

Washington today, for the investor-owned utilities of the nation, is a most important city.

It is where the first skirmishes of their particular battle of the New Frontier are being fought.

Several weeks ago, an early, precursory skirmish took place as the House of Representatives defeated—for the moment—an attempt to connect precedent-setting steam generation to a plutonium production reactor in the Pacific Northwest. Administration forces, evidently expecting easy victory, withdrew in amazement at the strength of the opposition they met.

The amazement turned quickly to rancor, to extremely strong comment, on and off the record, and to scarcely-veiled threats.

There was immediate talk of complete review of expiring hydroelectric licenses, of cooperative nuclear power development programs, of government-assisted nuclear insurance, of accelerated amortization certificates. There were allegations of lobbies and influence, of alliances and pressures.

It is plain that the unexpectedness, and the manner of this early defeat, has stung Administration supporters, regardless of whether the NPR skirmish was decisive, regardless of whether the opposition they encountered can be considered a fair sample of what they can expect on all power issues.

It is worthwhile to examine the background against which these early skirmishes are being fought.

The background is one of genuine international difficulties—of Berlin and the Congo, of Bizerte and Laos, of Castro and Jagan, of hijacked airplanes and Russian men in space, of foreign aid and NATO, of troop movements and disarmament talks.

It is one of real and imagined domestic difficulties—of recession and recovery, of lagging growth and growing inflation, of budget surplus and budget deficit, of need for tax credit and need for increased taxes.

It is in this framework, which must to the casual observer seem vaguely unreal, that the President must accomplish his deadly serious task of steering the nation through the shoals of international difficulties; it is in this framework that our earnest, serious Congressmen and Senators must assist him with all the wisdom and judgment that they possess.

It is in this framework that the New Frontier has cut loose a complement of planners and dreamers who would slowly and surely take the electric power industry into enlarged government operation.

Does this sound familiar? It should. The greatest inroads that the federal government has ever made in electric power have been made in the shadow of crisis —depression, recession, war, or threats thereof. Sometimes crisis was used as open excuse, sometimes merely a distraction.

Many of these inroads were easy and bloodless. None were reversible.

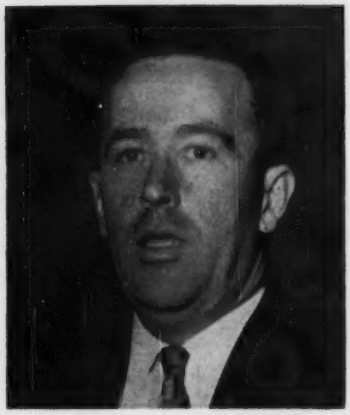
Memories of these inroads are enough to ensure that the industry will fight to keep the record from repeating, as long as it is convinced that it is not affecting the crises at hand. In this case, at this time, clearly it is so convinced.

Is it in the national interest that our overburdened legislators should be distracted at this time from matters more urgently needing their attention?

The planners and dreamers who chose the battleground must answer this question.

Hanford Conference Ends in Stalemate

SEN CLINTON ANDERSON



SEN HENRY JACKSON

The first attempt of Senate and House of Representatives conferees to resolve differences of opinion about the Hanford NPR generators apparently ended in a stalemate in a closed session last week.

Conferees refused to comment on discussions as they left the meeting, claiming "executive privilege." Sen Henry Jackson (D-Wash.) merely said ". . . we will probably be wrangling for some time."

Despite the reluctance to discuss the possible compromises that might have been considered at the session, it is generally believed by Washington observers that at least two proposals are before the group.

First is one by Sen Clinton Anderson (D-N.M.) who proposes reducing the size of the installation to one 400-Mw reactor that would be restricted to serve Hanford electrical needs only.

Second is a proposal attributed to Sen Jackson which would lift all preference clause restrictions from Hanford power. This would mean that all 700 to 800 Mw of Hanford power would go out on bid on a first-come, first-served basis to public and investor-owned utilities.

Although the first proposal is not considered a compromise at all by NPR generation opponents, led by Rep James E. Van Zandt (R-Pa.), the second is believed to be looked on with favor by some House Republicans who opposed the installation, providing it is backed up with 20-year contracts at prices that would guarantee complete amortization of the $95-million cost.

Of the eight conferees, six favor generating facilities and two are against, with one of the three Republican members siding with the Democratic majority.

Senate conferees are: Sens John O. Pastore, Anderson, Jackson (Democrats), and Bourke B. Hickenlooper and Henry C. Dworshak (Republican).

House of Representatives conferees are: Reps Chet Holifield and Melvin Price (Democrats), and Van Zandt (Republican). Sen Dworshak is the Republican who favors NPR generation.

News Scope

NUCLEAR NOTES — Atomic Energy Commission's Advisory Committee on Reactor Safeguards has approved the power reactor nearing completion at Elk River, Minn. Although cracks have appeared in stainless steel cladding inside the reactor vessel, the committee found the reactor met minimum standards, "if no further detrimental information develops." . . . Shippingport Atomic Power Station shut down Aug. 6 for partial refueling of its second core. Energy supplied by the 60-Mw nuclear plant at shut-down was more than 820 million kwhr into the Duquesne Light Co system. . . . Construction permit has been issued to General Electric Co by the AEC for the 12.5-tMw Vallecitos Experimental Superheat Reactor. Project is supported by ESADA, nuclear R&D establishment of seven New York utilities. . . *Fuel Reprocessing,* 685-page volume two of the AEC's four-volume second edition of the *Reactor Handbook,* has been placed on sale for $22 through Interscience Publishers, 250 Fifth Ave, New York 1, N. Y.

BOMBED-OUTAGES — Right-wing terrorist bombings in Southwest France caused several minor local outages when terrorists attacked a distribution transformer and high-tension-line towers in addition to their regular bombings of bars and public buildings. Outages caused by the plastic explosives blasting the door off a transformer lasted from one to three hours. Two unsuccessful tries to destroy the towers damaged them slightly but caused no service interruption.

CO-OP MERGER ASKED—Governing boards of Fayetteville Electric System and Lincoln County Electric Membership Corp have proposed consolidating the two systems. If approved by the Lincoln County co-op members in a ballot, the consolidation will be the first in Tennessee Valley Authority territory. Lincoln County co-op spokesman declared the merger will result in a amortization charges cut from a maximum of $1 a month to 50¢ a month.

Natural Resources Group Favored

A water resources council would be all right, but a broader natural resources council would be better—that was the general theme of witnesses who testified in favor of President Kennedy's proposed legislation (S-2246) to create a water council, river basin commissions and a federal aid-to-states program (EW, July 24, p 25).

Opponents of the bill, testifying before a joint session of the Senate Interior and Public Works Committees, said the measure would frustrate the very purpose it is seeking to achieve; and they also called it an improper intrusion of the federal government into state and local activities.

Administration Backs Bill

Earlier, Administration leaders had spoken out strongly in favor of the measure, including Interior Secretary Stewart Udall, Sens Clinton Anderson (D-N. M.) and Robert S. Kerr (D-Okla.). Kerr's now-defunct Water Resources Committee was largely responsible for the recommendations advanced by Pres Kennedy in his request for the bill (EW, Aug. 7, p 27).

The measure calls for a water resources council headed by cabinet secretaries, presidential authority to create various river basin commissions, and a 10-year, $5-million annual federal aid program to states to carry out local water programs. It has yet to be brought up for hearings by the House of Representatives.

Witnesses favoring the bill—including the National Rural Electric Cooperative Assn and the American Public Power Assn—reiterated their preference for earlier legislation (S-239) by Sen Clair Engle (D-Calif.) and 30 other Senators, which would set up a broader, more-independent White House council on all natural resources.

J. D. Brown, speaking for APPA, said the water resources council "should not preclude" enactment of Engle's bill to create a natural resources council. Brown questioned the effectiveness of the water council as long as it was headed by cabinet secretaries who would be unable to devote full time to the council. Brown also added that the ultimate solution might be creation of a federal department of resources.

NRECA's Charles A. Robinson Jr also spoke for the water council, although he thought the natural resources council would be better. "It appears the President has abandoned his pre-election advocacy" of a resources council, said Robinson, and he added that Pres Kennedy also had apparently abandoned his plan to place a natural resource unit within the existing Council of Economic Advisers.

Robinson also took issue with Kennedy's plan to have the water council review present feasibility standards (A-47) for federal multipurpose projects which were set up a decade ago by the Budget Bureau. He called this a "distinct retreat" from the President's Feb. 23 message, which called for the Budget Bureau to revise the standards within 90 days.

The National Assn of Soil Conservation Districts spoke of the water council only as a "companion measure" to the natural resources council, and added, "we are frankly skeptical about the ability of a water resources council, as proproposed in S-2246, to resolve interdepartmental differences and provide the country with the kind of resource leadership that is obviously needed."

Sen Clinton Anderson, chairman of the Interior Committee, said he favored the natural resources council, too, but he hadn't been able to persuade the Administration of his views. "This committee and other committees tried to point out that the proper home for an advisory council on natural resources was not within the Council of Economic Advisers. I think he (Pres Kennedy) had bad advice when he proposed to put it within the Council of Economic Advisers, and so did the Council of Economic Advisers."

V. W. Cothren of the National Lumber Manufacturers' Assn, asked whether inclusion of the Budget Bureau director on any federal resources council would help reduce budgetary control over resource programs—the number one fear of many Congressmen. "No," said Sen Kerr, because his inclusion probably would increase the Bureau's domination of resource activities.

Sen Gordon Allott (R-Colo.) also questioned whether the proposed bill would permit the White House to intervene unnecessarily in state water problems.

C of C Is Opposed

The US Chamber of Commerce opposed S-2246, "which appears to offer a desirable means for a coordinated and comprehensive water resource plan for the nation," but which will "instead, tend to nationalize all water and related land resource planning and development."

The National Assn of Manufacturers generally opposed the measure, unless considerable changes were made in it: inclusion of the Commerce Secretary and the Budget Director with the four other secretaries proposed to make up the water council; limitation of policy-making powers by the group.

Hearings on S-2246 were concluded with these witnesses.

TVA Breaks Own Records For Production, Efficiency

Tennessee Valley Authority set electricity production and steam plant efficiency records during the fiscal year ended June 31, TVA has reported.

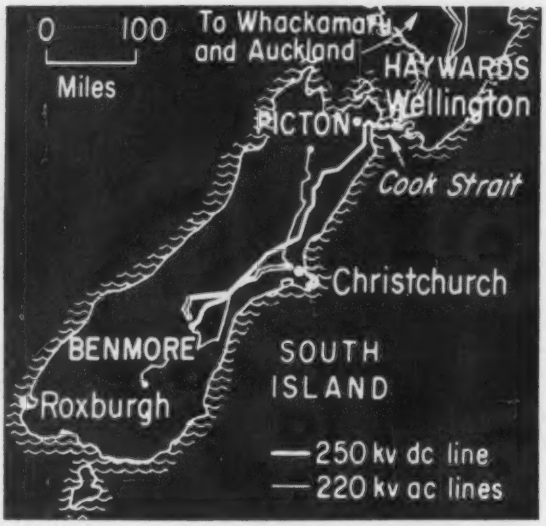
Net generation hit an all-time high of 64,517,177,449 kwhr. Hydro plants generated 26% of this and steam plants produced the remainder.

TVA steam plants also set efficiency and low-cost operation records. The system heat rate for fiscal 1961 averaged 9,500 Btu per net kwhr. This compares with an industry average of 10,720 for calendar year 1960.

TVA's steam-electric plants burned 19,150,472 tons of coal in fiscal 1961, an average of 0.804 lb per kwhr. This compares with 176 million tons consumed by total industry during calendar year 1960, with an average of 0.86 lb per kwhr.

Cost of fuel burned totaled $84,121,830, or 1.766 mills per kwhr.

New Zealand Cable Project Moves Ahead



The third high-voltage, direct-current, submarine cable installation—and the fifth dc installation of any kind—was brought a step closer to realization early this month when the New Zealand Electricity Department placed a $7,560,000 order with British Insulated Callender's Cables for three 26-mile, 250-kv cables which will join New Zealand's North and South Islands (EW, May 1, p 25). ASEA, of Sweden, has received an order worth over $15 million for the conversion equipment at both ends of the cable.

Plans call for a 335-mile, overhead line from a hydroelectric generating plant at Benmore, on the South Island, to Cook Strait and the 26-mile, submarine link, and a further 25-mile, overhead line to Haywards, North Island. All will operate at 500 kv between conductors and capacity will be 600 Mw. One of the three submarine cables will be used as a spare.

The cable contract is the first concrete step towards implementation of the project. The three cables are of the gas-filled type, using nitrogen at 450 psi. This is 80 psi above the highest external water pressure at the 834-ft deepest point.

Conductor weight will be 89.3 lb per yd in air and 63.4 lb per yd in water. Conductors, 80 sq in. dia, will have a spiral steel duct overlaid with four layers of copper wire. The lead alloy sheath will be reinforced with steel tapes, and the over-all armoring will bring outside diameter to about 5 in.

The three cables will be laid 400 to 600 yd apart to allow for easy identification if faults require raising one cable. Laying is expected to be hazardous in view of the very swift currents in the Cook Strait area. There will be no splices in the cables, and each 26-mile length will weigh about 1,600 tons. The investment represented by the provision of a third cable will provide a very high degree of reliability.

Other dc installations are: Sweden-Gotland, 60 miles, 100 kv, 20 Mw (in service since 1954); Moscow-Kashira, 70 miles, 200 kv, 30 Mw (experimentally in service since 1954); England-France cross-channel cable, 31 miles, 200 kv, 160 Mw (to be commissioned this year); and Stalingrad-Donbass, 350 miles, 800 kv, 750 Mw (said to be ready for partial commissioning in 1961-62). The Sweden-Gotland and cross-channel cables are submarine.

Plans for Nuclear Plant May Change in Britain

Permission to construct a 2,000-Mw, oil-fired steam generating station at Fawley, near Southampton, is being sought by Britain's Central Electricity Generating Board. CEGB says that if permission is granted, the proposal to build a nuclear power station at Hamstead, Isle of Wight, will be "deferred."

The Hamstead nuclear scheme was strongly criticized when it was announced last year, and CEGB promised to investigate fossil-fueled alternatives. There have been objections to the Fawley proposal too, but as the station would be built on reclaimed land and salt marsh and near an oil refinery, aesthetic objections are less strong than at Hamstead, a noted beauty spot.

The Fawley station would be connected to the national grid system by an overhead 400-kv transmission line northwards and by undersea cable across Southampton Water. Cost of Fawley station would be about half that of Hamstead, while output would be "several times higher," CEGB maintains.

International Standards Set by World-Wide Group

At the 1961 session of the International Electrotechnical Commission (IEC), 24 draft recommendations for standards were approved for publication and 74 more were endorsed for circulation among member countries. The meeting was held at Interlaken, Switzerland.

Among recommendations approved was a method for artificial aging of insulating oils. For the breakdown voltage test, a continuous voltage increase of 2 kv per second was adopted.

Five insulation classes for dry type transformers accepted are: (A) 60C, (B) 80C, (F) 100C, (H) 125C, and (C) over 125C, maximum temperature rise.

The maximum oil temperature rise for oil-filled transformers was set at 60C. For forced oil circulation the maximum copper temperature rise was fixed at 70C.

More than 1,000 delegates from 38 countries attended the meeting, with largest delegations coming from Great Britain, Germany, France, Switzerland, Sweden, Netherlands, US, Italy, and Japan, in that order.

- Montana's Senator Metcalf calls for new look at FPC hydro licenses
- List of 46 projects where licenses expire in next ten years compiled
- Review would be tied to examination of conduct on Hanford legislation

Review of Hydro Licenses Urged

The fate of investor-owned hydroelectric projects when licenses expire has been raised in the Senate by Sen Lee Metcalf (D-Mont.) as a possible retaliatory measure against power companies for their opposition to power facilities at the Hanford, Wash., nuclear reactor.

The question of renewing or cancelling private hydro power licenses, issued by the Federal Power Commission, after their 50-year terms expire, is not new. It was explored at length by the FPC and the House Legislative Oversight Committee after a September, 1958, hearing (EW, Oct. 6, 1958) and the prospect of a "federal versus private power fight of unprecedented proportions" was raised again in a report last January by the same group.

Ties Study to Hanford

Tying the issue to Hanford opposition, however, is a new tack. Said Metcalf: "It is disturbing that the day after the Russian cosmonaut circled the earth 17 times and landed safely in his homeland, directing world attention to his nation's accomplishments in the new space sciences, an alignment of vested interests would even seek to prevent the construction of the world's biggest atomic generating plant in this nation . . . If the government is going to be stopped short every time a new science approaches practical application, then perhaps we had better start looking at opportunities to undergird our security by recapturing some of the old-fashioned means of production including the generation of energy. Along this line I have compiled a list of hydroelectric projects in the US on which licenses will expire in the next ten years." He said these 46 projects have a capacity of about 1 million kw, an annual energy output of about 10 billion kwhr.

Called Agents of Government

"Under all circumstances that prevail today," said Metcalf, "I think it is timely for the nation to start considering policy in relation to these expiring licenses at once . . . We are at a point in history of power development when these expirations will be increasing, and when policy about renewals should be set. Utility companies, because of the nature of their business, are agents of government. They operate under franchises granted by government, to perform a public function.

"We need to know how well the private utility industry has done its job as the agent of the government, whether it has provided the nation with most modern facilities and an abundance of electric power at low prices, or if it has acted as a brake on development, retarded extensions of service—as in the case of rural areas—and facilitated or retarded our economic growth."

Metcalf tied the "policy review" to Hanford in the following words: "Certainly the industry's conduct in the Hanford Plant situation needs to be reviewed. To what extent has this agent of government used its economic means gained through public franchises, to thwart policies and projects in the public interest? Has it dared to jeopardize the nation's security for selfish ends? Is it a good influence in our national affairs, or a dangerous one? Should the nation continue to entrust public resources to these agents, or is it time to exercise the federal rights under the Federal Power Act, and strengthen its own yardstick power operations both to assure our citizens abundant energy at reasonable rates and to undergird the national security?

"I am not now offering answers to these questions," Metcalf concluded.

FPC Controls Licenses

The FPC has authority to renew hydro power licenses, claim them for the federal government, or reissue them to different parties. Due notice and public hearings are required under the act. One major, unresolved matter in the cancellation of a license would be payments to the previous licensee for loss of the project.

Plant Name	Licensee	Installed capacity (Kilowatts)	Date license expires
Adams-Schoellkopf	Niagara Mohawk Power Corp	169,500	Mar 1, 1971
Big Creek Nos. 2-A and 8	Southern California Edison Co	138,500	Mar 2, 1971
Mitchell	Alabama Power Co	72,500	June 26, 1971
Big Creek No. 3	Southern California Edison Co	110,000	Mar 3, 1971
Bucks Creek	Pacific Gas & Electric Co	40,000	Dec 31, 1968
Bellows Falls	New England Power Co	43,000	June 30, 1970
Holtwood	Pennsylvania Power & Light Co	108,800	June 30, 1970
Cabot-Turners Falls	Western Massachusetts Electric Co	55,840	June 30, 1970

LIST OF 46 PROJECTS where FPC hydro licenses are due to expire in the next ten years include these eight of over 40 Mw, the largest of the group. Most of the remainder are much smaller in size, with a majority less than 10 Mw

AIEE's incoming president, Ohio Bell executive Warren H. Chase, examines the Institute during a searching question-and-answer period with Electrical World editors

Chase Reviews AIEE Status

Q: Mr Chase, as you assume office, what do you see as the most pressing problems facing AIEE?
A: As I see it there are two real problems demanding our attention. One thing that we haven't considered enough is the difficulty of keeping engineers up to date in their fields in this era of exploding technology. This is, of course, an accelerating trend, and we'd better get to it before it gets out of hand. The second problem—and it's related to the first—is the problem of communication between the various disciplines in the engineering fraternity.

Q: In acknowledging your election as president of AIEE at the Summer General Meeting in Ithaca, you called for a better organized, better coordinated engineering fraternity. Did you have these problems in mind at that time?
A: Yes, I did. Over the long term, there is bound to be a trend toward the concept of unity in the engineering profession. Many approaches have been made to the problem, and more will be made in the future, I feel sure. But we have to walk before we can run. The best way to go about this is to explore, together with the other societies, areas where we have common interests. We already have the apparatus for this—Engineers Joint Council, Engineers Council for Professional Development, and the National Society of Professional Engineers—and these groups can help to act as bridges. We are getting to the point of having a great many "gray areas"—where knowledge overlaps—and this is where we should look right now.

Q: Is there any progress being made today toward integration of AIEE with other engineering societies? Is there any prospect of merging two or more into a single organization?
A: I think so. But the complexities of this sort of merger are great. Personally, I would like to find some way of getting AIEE and IRE together. This is another case of walking before we can run. It would have to be the first step toward a larger unity program, but a lot of exploration and study lies ahead.

Q: But what can be done about this sort of problem at the "grass roots" level?
A: I'll give you an example. In Cleveland a drive by a combination of societies has enabled us to build the Cleveland Engineering and Scientific Center. We will have, when completed, meeting rooms for 55 technical societies and we can seat 1,200 people in the central auditorium. Improved communications among engineers in northeast Ohio is almost visible—although I am somewhat prejudiced.

More than this, though, the spread of the special technical conference, where engineers from various disciplines but common interests meet, is continuing on a local as

It takes four closely spaced typewritten pages to list the activities of Warren H. Chase, incoming president of the American Institute of Electrical Engineers. And this just covers his basic activities, with no space left for his multitude of non-organization interests.

Chase calls himself a "latitudinarian," which *Electrical World* editors, upon consulting the dictionary, have discovered means a man with a wide range of interests who encourages expressions of differing opinions. This he is. Although he is to retire as vice president-administration of Ohio Bell Telephone Co in two years, Chase has more enthusiasm for the future than any sophomore E.E. who has just discovered that he can grasp alternating current theory.

A native Clevelander, Chase has, according to his contemporaries, carried many civic projects in the area for the last 20 years on his broad back with no harm to an equally broad grin. He was named Engineer of the Year by the Cleveland Society of Professional Engineers in 1960 and was given the Distinguished Service Award this year by the Cleveland Technical Societies Council.

Ohio Bell people say that Chase is the handiest man with tools in the Bell System. His wife, Margaret, is an accomplished golfer and amateur organist. Their son, Warren III, manages a large plastic plant in Pennsylvania and has two children who give their grandfather another reason for keeping active.

'. . . two real problems demanding our attention . . .'

well as a national level. This does not mean that general meetings are on the way out—they're not—but we are beginning to realize that we can't keep up with developments without these special technical conferences.

Q: Past President Linder announced the naming of three task forces: a Committee of Action to lay down a clear concept of AIEE objectives, a group to find manpower to serve as officers and personnel, and a Council of Technical Consultants to monitor AIEE operations in the interest of enhanced efficiency. What part will they play in your term of office?
A: All of them will be continued. Naturally, it is a little early to tell what their findings will be. We're still in the process of forming the Committee of Action, and I think its work will be vitally important to the future of AIEE. The second committee has filed a report with the AIEE board of directors, and that's being studied. The third group is just getting started, but we expect great things from it.

Q: Along that line, do you have any plans to alter the AIEE organization in the interests of greater efficiency?
A: Not specifically. I think our departmental organization is basically sound. Of course, any changes would await the report of the committees to which I just referred. But for the time being, there isn't much point in turning everything upside down just to show that you are in charge.

Q: Do you see a role for the Institute outside of the US?
A: Definitely. It's time we looked overseas more often. Engineering know-how is the most valuable export we have—much more so than free money. We ought to be able to offer the government a program in this field which would make foreign aid a meaningful operation. And, of course, we should strengthen our ties with similar societies in other countries.

Q: What steps can be taken to make AIEE technical sessions and programs more stimulating?
A: That's a tough one. Maybe we have been too polite to each other. We seldom see the knock-down and drag-out battles over technical subjects that used to add so much to earlier meetings. But the biggest move we can make is to increase the participation of our younger engineers in Institute activities. Top management is losing a valuable aid when it doesn't encourage junior men to write papers, attend meetings and get caught up in professional affairs. I've always made it a point to consider this in evaluating men for promotion. This practice can't help but increase interest. Again, it is grass roots effects that we are looking for. Through joint technical meetings on a local level, we want to establish programs that will cover all of the many areas that interest our members. Every man in the Institute should always identify himself with its operations.

Sen Randolph to Be Luncheon Speaker

Sen Jennings Randolph (D-W. Va.) will be the featured luncheon speaker at the Fifth *Electrical World* Electric Heating Conference on Monday, Sept. 25, at the Sheraton-Park Hotel, Washington, D. C.

Sen Randolph will talk on the objectives of the National Fuels Study. He recently presented a resolution to the Senate Interior Committee calling for a special national fuels and energy study.

In addition to those announced last week (EW, Aug. 21, p 40), many other top speakers have been lined up for the two-day meeting.

Included are R. Dunn, president, Potomac Electric Power Co; L. L. Koontz, Appalachian Power Co, speaking on "You Must Hit the Modernization Market;" C. E. Anderson, Virginia Electric & Power Co, "Here's How to Sell the Builder;" and Laurence Pierron, Commonwealth Edison Co, "Where

SEN JENNINGS RANDOLPH

Does Electric Heating Figure in the Commercial Market?"

A panel on the latest in equipment developments will feature Robert Pierce, Lennox Industries Inc; William McGrath, Carrier Corp; and Fred Kreiser, Edwin L. Wiegand Co.

INAUGURAL SESSION of Latin American Electric Power Seminar is opened by Manuel Tello (second from left), Mexican Secretary of Foreign Relations. Others, from left, are Manuel Moreno Torres, director of Mexico's Federal Electricity Commission and seminar chairman, Cristobal Lara, Economic Commission for Latin America, and Miguel Albornoz, United Nations

Latin America Looks at Power

More than 160 delegates to the Latin American Electric Power Seminar in Mexico City July 31-Aug. 12 measured the enormous task of tripling Latin America's electricity supply in the next ten years, and came up with recommendations which focused attention on the central question of adequate rates.

Governments Well Represented

Heavily weighted with representatives of government enterprises, the meeting could have been a sounding board for public power advocates. But the issue of public vs investor-owned power was relegated to a few skirmishes, while experts from both government and investor-owned companies generally saw eye-to-eye on the need for rates high enough to provide substantial self-financing as well as to attract additional capital and credits to round out $13 billion of investment through 1970.

The conference, organized by the Economic Commission for Latin America (ECLA) and other United Nations agencies, showed that administrators and engineers of electric power companies south of the border take a realistic view of their problems. Observers were somewhat less optimistic on whether politicians will make the right decisions on rates, choice of projects and other issues charged with political emotion.

Yet there were encouraging signs. Argentina and Chile have already overhauled electric tariffs to assure an adequate return on capital. Delegates from Brazil, in private conversations, said the outlook is good for an upward revision of that country's rate structures, which amidst galloping inflation are still based on historical investment costs.

And there were indications that Mexico, which plans to integrate its recently-purchased private companies and existing government utilities in one giant organization, is also considering an upward revision of rates.

Organizers steered the conference away from debate on public vs investor-owned power, but a few scattered verbal blows were traded on the issue. Mexican delegates lauded the achievements of public power in Mexico and took occasional jabs at the former investor-owned companies. Most combative spokesman for investor power was Venezuela's Ricardo Zuloaga, manager of thriving La Electricidad de Caracas, who declared flatly that the basic problem of the electric industry was "excessive state intervention."

Osvaldo Fernandez Balmaceda, of Cuba's Central Planning Board, asserted that international cooperation "has not been between equals," and charged that American & Foreign Power's expropriated Cuban subsidiary had built inefficient thermal plants. In a blunt rebuttal, Marvin S. Fink, Ebasco International Corp, called attention to the alternatives of building high-efficiency plants at high cost, or lower-efficiency plants at lower cost. He observed ironically that Cuba's seizure of a $300-million property was an example of "international cooperation, though involuntary," and drew applause with his conclusion that "the principles applied in Cuba will be of little value to the democratic countries of this hemisphere."

N. M. Chuprakov, of the Soviet Ministry of Plant Construction, predicted that the Soviet Union would overtake the US in per capita electric consumption by 1980. This provoked a polite expression of skepticism from Edwin Vennard, Edison Electric Institute, who also criticized TVA.

Basic dimensions of Latin America's electric power problem were outlined in documents submitted by the conference secretariat. In 1959 Latin America had an installed capacity of 16 million kw—42% of it hydro—and produced 61.5 billion kwhr. ECLA estimates that by 1970 the region will need another 30 million kw of capacity, or a total of 46 million kw, to produce 200 billion kwhr annually. According to present programs, hydro will increase to 24 million kw, or 53%. Of the installed capacity, Brazil had roughly 4 million kw, Argentina and Mexico each 3 million, and Chile and Venezuela about 1 million each.

Extensive Financing Needed

The estimated $13 billion needed to add 30 million kw represents 7 to 9% of the total anticipated capital investment in Latin America in the next decade—as compared with only 5% for electric power expan-

sion in the past decade. Generation has been increasing 8.8% annually as compared with an average annual growth of only 4.5% for its gross national product. Since close to 40% of the capital outlay will go for expenditures abroad, the expansion program will take an estimated 6% of the foreign exchange available to Latin America countries in the next decade.

Low Rates Deter Investment

Participation of private capital in electric power in Latin America has been declining steadily. Observers attribute this to a slowdown caused first by the depression of the 1930s, followed by a materials shortage during World War II, and finally by unattractive rate regulations in the post-war period. Mexico's power industry is now wholly public, that of Argentina and Chile is predominantly public, and in Brazil the public sector will soon outweigh the investor-owned largely due to expansion of public power in newly-developing areas. Investor-owned power still predominates in Peru and in Venezuela, where public activity has been mainly in the construction of generating facilities.

Installed capacity of investor-owned electric firms dropped from 54% of the total at the end of 1959 to 42% a year later, due to the expropriation of American & Foreign Power's Cuban subsidiary and the Mexican government's purchase of the Mexican Light & Power Co. Investor-owned companies' part in electric power distribution in Latin America, however, is considerably greater than their share in generation. ECLA says foreign private capital—assuming that its participation in electric power expansion will not exceed its present 20%—could contribute $100 million annually. However, ECLA warns that an adequate rate structure will be required to make private investment attractive.

The final (provisional) report, presented by Raul Saez Saez, *rapporteur* of the conference and general manager of the Chilean government's Empresa Nacional de Electricidad, S. A., pointed to rates as the key to the future of electric power in Latin America. The report stated: "The entire problem of electric power development was summed up in the determination of sales tariffs. The level and structure of rates would hav an important impact on current and future demand, but would also determine the profitability of the enterprise, its capacity for financing expansion from its own resources or for attracting fresh capital."

Concerning regulatory legislation, the report observed that Latin American countries have generally been more realistic with respect to variations in operational costs than as regards investment costs. It declared that "rate regulations which establish the yield on the investment according to its original or historic cost—in such a way that the repayment of capital in real terms may be penalized in cases of monetary devaluation—not only affect the financial aspect of electric power development, but also distort the process of choosing between alternatives and encourage the investor to prefer the less capital-intensive project, i.e., generally speaking, the thermal power plant."

Brazil was cited as the prime example of a devaluation-ridden country which still bases rates on historic investment costs. At the other extreme is Peru, which has "practically solved" its problem of electric power supply, according to Augusto Martinelli Tizon, Ministry of Development and Public Works. Under a 1956 law providing for electric rates which yield 8½% tax-free dividends plus a 3% company profit which is virtually tax-free if invested, Peru increased its installed capacity from 400 Mw in 1956 to 840 Mw in 1961.

Report Skirts Ownership Issue

The final report carefully avoided taking sides on public vs investor-owned power. But it pointed to "the importance of recognizing the economic and financial effect of a political decision on this problem. For example, if the state directly replaces private enterprise in providing an electricity service, it should bear in mind, in so doing, that it closes off a source of financing for the expansion of this sector."

The seminar report cited as one of the problems of the electric power industry in Latin America "the tendency to consider the service rendered as a social question without giving the economic aspect its proper due." Mexican delegates were among those who placed greatest emphasis on social service. But the majority of delegates stressed the necessity of running electric power companies, whether state or private, on a businesslike basis. They also generally agreed that electric utilities should not divert public funds—whether in the form of subsidized rates, government appropriations or low-interest loans—from other fields where government investment is needed.

The seminar urged planners to take into account such limiting factors as the balance-of-payments and the shortage of available capital resources in order to determine the "optimum concentration of capital in the electric development plan." In comparing generating sources and other investment alternatives in the electric power field, it said, the cost of financing should be calculated on the basis of an "opportunity cost"—roughly the prevailing interest rate—which is estimated at 10 to 12% in Chile, Uruguay and Argentina, as compared with 5.5% on US federal projects.

Warned Against TVA-Type Projects

The seminar warned that Latin American countries suffering from severe capital shortages should be "very careful" of TVA-type projects and schemes such as subsidized rates to stimulate development of specific regions, and should give priority to projects where electric power demand already exists.

Conference observers said that Chile is doing an excellent job in programming its electric power development, and Mexico is turning in a creditable performance. A secretariat paper took Argentina to task for delaying a decision on the big Chocon and Salto Grande hydro projects.

On the question of frequency unification, both Mexico and Venezuela face a difficult problem, with a populous and industrialized capital on 50 cycles and the rest of the country on 60. Delegates from the two countries adopted a wait-and-see attitude on the question. But Mexico is considering the possibility of establishing a 50-cycle ring around Mexico City, and another 60-cycle exterior ring to which transmission lines from other parts of the country would be connected.

Build Student Interest in the Atom

Utility-sponsored meetings spur interest of Texas youths and teachers in nuclear science and scientific education

Kindling the interest of high school students and teachers in nuclear science and providing them with on-the-spot answers about higher education as well as careers in science is the two-fold purpose behind a state-wide program of symposiums being sponsored by investor-owned electric utilities in Texas. Within the framework of the Texas Atomic Energy Research Foundation, 11 member companies in the state are thus working to generate interest in nuclear science at the local level.

Still in its first year, the program has won widespread praise from educators and students across the state and has been commended editorially by many Texas newspapers. The papers in the state have displayed great interest in the symposiums and have devoted considerable space to their coverage.

Texas Atomic Energy Research Foundation was formed in 1957 primarily to conduct a major research program in nuclear energy. TAERF and General Atomic Division of General Dynamics Corp jointly have underway a program in nuclear fusion research aimed at controlling the thermonuclear reaction for generation of electric power.

The aims of TAERF, however, are broader than the controlled fusion research program alone. The Foundation hopes to help advance the knowledge of nuclear science in Texas and to bring to students and teachers a realization of the privileges, responsibilities and opportunities presented by scientific discoveries in nuclear energy. To this end the Foundation and the member utility companies last year sponsored the nuclear science symposiums for Texas high school science students.

Local Company Sparks Meeting

Thus far, one-day meetings have been held in seven different cities, with a number of others already scheduled or planned. Each meeting was sponsored by the local power company in cooperation with the public schools and TAERF. In some instances, local colleges have joined in sponsoring the meetings.

Participants have been junior and senior high school science students selected by their schools on the basis of demonstrated interest and ability in scientific subjects. Students are accompanied to the symposium by their teachers. In a number of cases, the meetings also were opened to students and teachers from schools in neighboring cities and towns.

More than 7,000 students and teachers have attended the first seven meetings. The meeting places and the number in attendance have been Corpus Christi, 900; Waco, 1,100; Beaumont, 1,350; Houston, 1,600; Dallas, 1,200; Abilene, 650; and Odessa, 460.

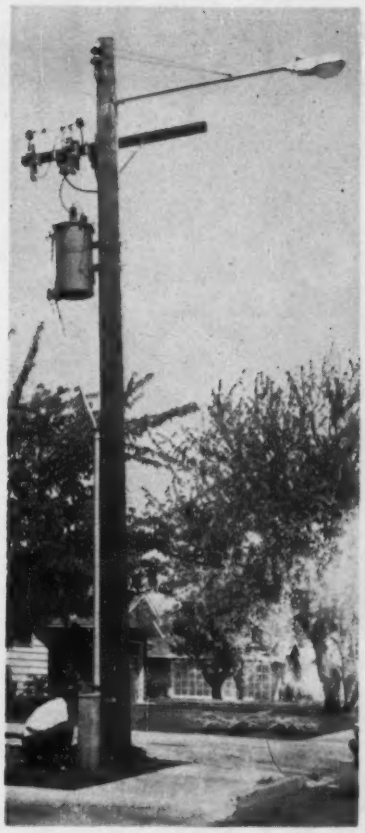
The meetings are arranged to bring to the students lectures on nuclear physics and nuclear fusion research by outstanding scientists. The meetings also give the students an opportunity to ask about scientific careers and college science curricula.

The symposium sessions have usually included a morning period of scientific lectures. During the afternoon, panel discussions aim at answering questions of both students and teachers. In these discussions, the lecturing scientists have been joined by faculty members from local universities or representatives from local industries to provide a broad level of educational and business experience.

Speakers have been scientists, mostly from General Atomic, whose academic background suits them particularly for addressing groups of young science students. Speakers have included such men as Dr E. C. Creutz, General Atomic's vice president—research and development, and Dr D. W. Kerst, director of the fusion research project at General Atomic and inventor of the betatron particle accelerator.

In June TAERF also sponsored with the University of Texas a four-day nuclear science symposium attended by 400 selected high school science students and their teachers. Expenses of the participants were paid by their local electric companies. Featured speaker was Dr Willard F. Libby, University of California at Los Angeles, a Nobel prize winner in chemistry.

HONOR SCIENCE STUDENTS from local high schools talk with Dr E. C. Creutz of General Atomic at the meeting sponsored by Houston Lighting & Power Co



TRANSFORMER on street lighting poles . . . with buried primary and service cables to homes enhances subdivision as . . .

Joint-Pole Use Cuts Underground Cost

Standard distribution transformers on poles with street lighting is economic compromise for Oregon subdivision

J. A. **FRISBIE**, Manager, Salem Electric Cooperative, Salem, Ore.

Standard distribution transformers on poles with street lighting cut the difference between underground and overhead costs to where residents of a new 350-home subdivision near Salem, Ore., pay only an additional $1 per month.

This charge, added to the regular bills by Salem Electric Cooperative, applies to homes priced at $15,000 to $35,000 and is based on an estimated value of $125 per lot.

This arrangement eliminates the incremental cost of pad-mounted transformers and their installation. The savings to the utility are passed on to the customers.

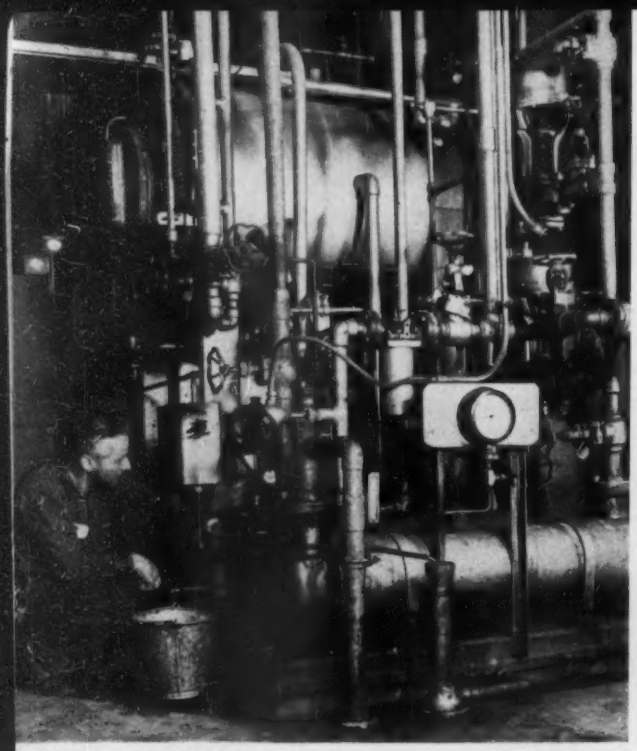
As the subdivision needed its own street-lighting system, the utility decided during construction to mount the transformers together with the 175-w mercury vapor lights. The latter have self-contained photoelectric cells. The system evolved gave somewhat random, although acceptable, street lighting, because the pole sitings were determined so that a customer would not be farther than 250 ft from a transformer.

Potheads on Crossarm

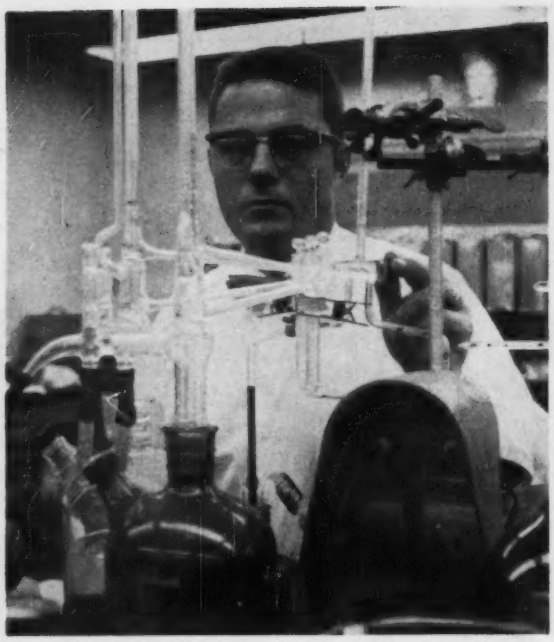
At each joint installation, the primary cable terminates at potheads on the crossarm. From thence leads go to cutouts and then to the transformer. Lightning arresters protect the terminations. The secondary goes to a distribution box at the base of the pole, and the services to ten to 13 customers.

These services from the distribution box are 3/0 aluminum-type USE. For customers more removed from a transformer, a pair of 250-MCM, synthetic-rubber-insulated copper wires are run to a power pedestal from which individual pairs of No. 1 Buna-S-insulated copper wires serve up to four houses.

Plans call for conversion of the primary feed from radial to loop. When the system has been completely developed, it will have a 7.2/12.47-kv loop feed from a Bonneville Power Administration substation. The aluminum primary cable will be No. 2 or No. 4 shielded 15-kv with PVC jacket over its polyethylene insulation. The primary will be buried 48 in. in the sandy loam soil.



VAPOR EXTRACTOR keeps minus pressure on oil reservoir, removes air, moisture, hydrogen from turbine lube oil



CHEMICAL LABORATORY tests average of 750 oil samples annually, samples being taken every thousand hours

Lube Oil Lasts Up to 175,000 Hr

Philadelphia Electric tests show stations get long use from unit design, lube system, oil choice, maintenance

Turbine lubricating oils have exhibited uniformly long service life at the generating stations of Philadelphia Electric Co, particularly at Richmond Station. There Units 10, 11, and 12 have run as long as 115,000, 111,000, and 175,000 hr, respectively, on their original charges.

Although the Richmond units logged more operating hours on initial oil charges than other units in the generating network, the pattern of long service life is evident in analyses of the lubrication records of all other turbines of the company.

Tests on viscosity, neutralization number, inter-facial tension, and color are run every 1,000 hr, more than 750 oil samples being tested annually at the PE chemical laboratory. The company attributes the lubricating oil life to these factors:

1. Design of the turbines and their lubricating systems
2. Quality of the turbine lubricant (Gulfcrest 44)
3. Maintenance of the lube systems to keep oil uncontaminated.

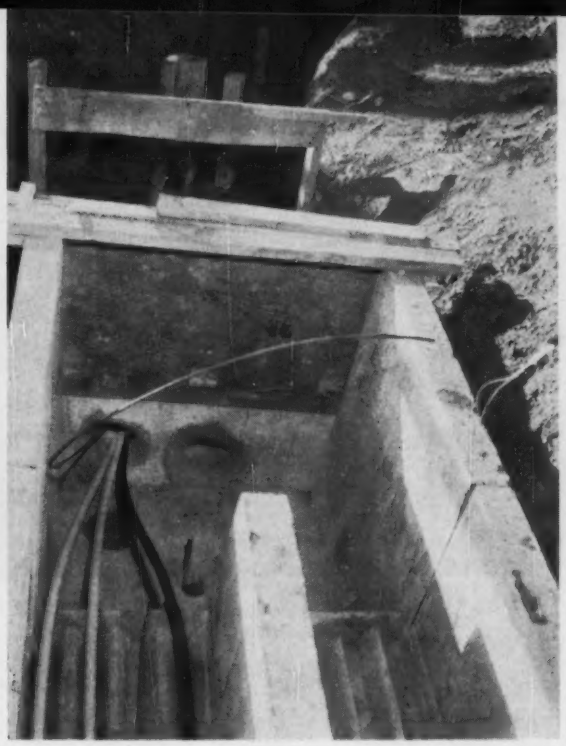
The most recent analysis of oil in Richmond Unit 12 shows that oil in service since December 1937 is still very near its original specifications. In 23 years, its viscosity increased only 5 points to 156, and its neutralization number from 0.04 to 0.08. Color darkened only to 3.5 from the 1.5 of new oil. Furthermore, findings for Richmond's Units 10 and 11 are remarkably similar.

At Schuylkill Station, Unit 8 has run for 84,087 hr on one charge of oil, the record for this station. The turbine was filled in May 1946. This oil, as determined in the latest analysis, has a viscosity of 155, a neutralization number of 0.06, an inter-facial tension of 29.1, and a color value of 2.

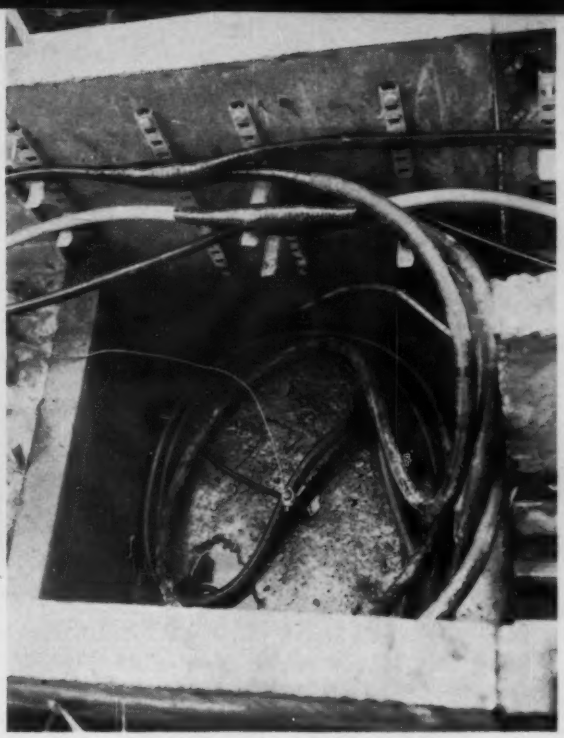
To obtain such results, Philadelphia Electric equips its units with an efficient lubricating system. Its newest turbine, installed July 1958 at Schuylkill, has a DeLaval centrifugal separator, two Andale coolers, and a vapor extractor. This 175-Mw, 22-stage turbine operates at 3,600 rpm with 2,400-psig main steam at 1,050 and 1,000F reheat.

The unit's lubricant is delivered from the oil reservoir by an oil-driven booster pump at 20 psi to the main pump, which discharges at 200 psi. The oil then drives the booster, which acts as a pressure reducer, lowering the pressure from 200 to 40 psi. The oil goes then to the bearings. Some 200-psi oil is used for hydraulic power. The 40-psi oil is the header pressure at shaft elevation.

The vapor extractor, maintaining a constant minus pressure on the reservoir, removes air, moisture, and hydrogen traces from the system. The oil separator operates continuously with a throughput of 450 gph, and the coolers lower the temperature of the oil coming from the unit by about 30F. Although lube equipment differs somewhat from station to station, turbine oil treatment is similar at all.



STEEL CONDUIT is 24 in. below roadway, grouted in drop sections. One neoprene, two PVC cables are in the duct



Y SPLICES are made in drop sections to connect customers' cables to power company's supply cables as shown

Pre-fab Concrete Trench Guards Cable

Has flexibility, economy for underground service in Puget Sound industrial park

ALBERT KAYE, Engineer, Puget Sound Power & Light Co, Bellevue, Wash.

A shallow precast concrete trench with sidewalk top, carrying primary voltage conductors, was installed by Puget Sound Power & Light Co to provide underground service to a new industrial tract. It is the first such Puget installation and appears to be an economical solution with flexibility for dealing with varying load requirements and service conditions.

When Puget was asked to provide underground service, no firm estimate could be made of future load, as only one tract of land had been sold. The United Control Corp of Seattle, supplier of aircraft components and fittings, had purchased a 52-acre tract near one of the boundary roads of 500-acre Overlake Regional Industrial Park, east of Bellevue, Wash. This, one of the first planned industrial parks in the greater Seattle area, is planned for light industrial, commercial, and professional uses.

Initial requirements of United Control were about 1,500 kva, and the primary underground 12.5-kv delivery point was to be 1,100 ft from the nearest overhead line. Ultimate load was estimated at 6,000 kva.

Distances of probable building sites from the main roads dictated that service to all area customers be at the primary voltage of 7.2 kv, single-phase, or 12.5 kv, 3-phase grounded wye. It was foreseen that small electrical loads near buildings and large industrial users would have transformer vaults, or unit substations, on their properties. But Puget engineers were not satisfied that conventional types of underground systems could solve the area's problems. These included:

- Customer sites 100 to 800 ft from main roads, with size of tracts and position of service taps to be determined as industry moved in.
- Space for installing all other utilities underground.
- Uncertain rock and sand formations and underground streams.
- Unknown future subdivision of the property.
- Unknown power demands of future customers.
- Necessity for at least two supply circuits for future load growth and dual service to critical industries.

The idea of a shallow trench carrying primary voltage supply conductors evolved among Puget engineers, and its practicality was determined from these factors:

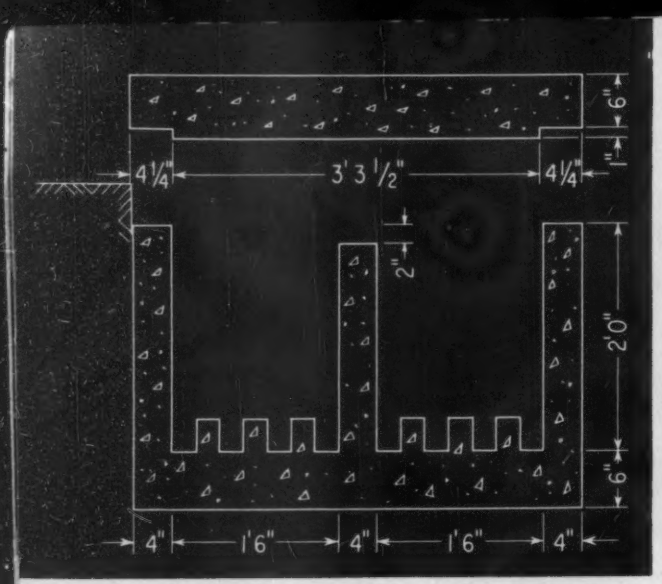
1. The total cost would be comparable to conventional duct and vault underground systems.

2. Primary voltage supply could be tapped off at practically any location, a necessity in this development.

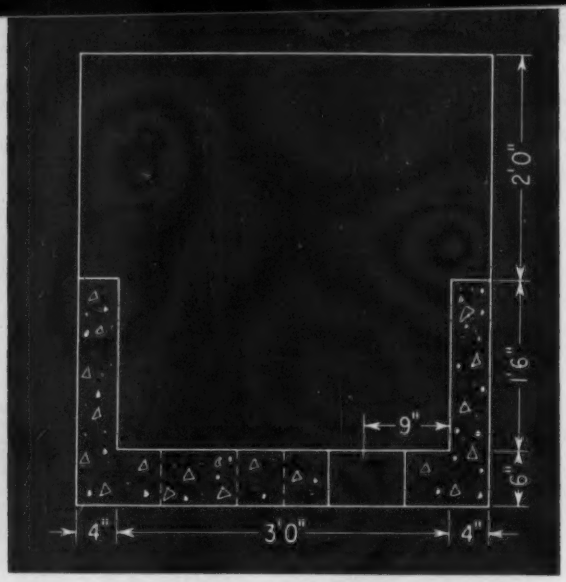
3. There would be a minimum of digging and, therefore, minimum interference with other utilities at crossovers.

4. It would be very easy to change out the conductors initially installed and add circuits as load increased.

To make the trench as shallow as possible, it was decided to make the top of the trench a sidewalk,



CROSS SECTION shows details of cable trench and sidewalk topping it. Costs compare with duct and vault



DETAIL of drop section shown. Drop section was designed to obviate crossing over of two circuits in cable trench

which would be an added feature in development of the entire area. The top slab was designed with reinforcing steel for a 20-ton loading. This seemed necessary as future driveways over the slab could be anywhere along the entire length of the trench.

The width of the top slab was set at 48 in., which is common for sidewalks in the Pacific Northwest. It was also a dimension which could accommodate the two 12.5-kv circuits, side walls, and divider wall. To keep the weight below the capacity of the boom on a typical line truck, and yet make it too heavy to move with planks or crowbars, a design weight of 3,350 lb was selected. This resulted in a calculated length of 10 ft.

The possibility of a future customer desiring dual service and creating a crossover of two circuits presented a problem. The "drop section" or "service take-off" was designed as a solution. Space was provided for making T or Y splices on the main supply cables. One primary service can take off through a "thin" knockout in the sidewall, or can be trained to go into the 7-in. hole in the bottom of the section. The hole will accept conduits up to 6-in. dia. The second or dual primary service can be trained into a second 7-in. hole in the bottom of the section to provide the crossover of circuits without interference between the two sets of conductors.

PRECAST CONCRETE TRENCH is shallow yet carries primary conductors for underground service to industrial park. Its top slabs provide sidewalk reinforced for 20-ton loading

Road Crossings Protected by Steel Conduit

Crossing under roads were made with steel conduit, including one 6-in. steel conduit per future 3-phase circuit. Transitions from the conduits to the trench were made in the same "drop section" described above.

The trench is designed for two 3-phase, four-wire circuits in the bottom ribs. If needed, circuits can be increased to six by the addition of brackets along the side and center walls. The cable initially installed is single-conductor, No. 2 copper, 15 kv, butyl insulated, shielded with 0.0045-in. tape and protected by either neoprene or polyvinyl chloride jacket. Admittedly, this conductor size is small for the anticipated load, but is economically justifiable until more customers increase system demands.

For some years, Puget has used a black neoprene-jacketed cable for direct-buried installations. The yellow-pigmented polyvinyl chloride jacket was adopted recently to aid in distinguishing of company-owned from customer-owned cable.

During the trench design, Graystone Concrete Products Co of Seattle was asked for suggestions. Final designs included reinforcing steel other than was necessary for proper "in place" strength. It allows the precast sections to be made at Graystone's Seattle plant for transportation 20 miles to the job site.

Industrial Electric Co, Seattle, was the prime contractor, its crews doing the installation work, including cable placing.

Use Harmonic Voltage for Excitation

PAUL I. NIPPES, Manager, Two-Pole Synchronous Machine Section, Elliott Co, Ridgway, Pa.

A synchronous generator can use its harmonic voltage output to provide its exciting voltage. A safe, reliable and inexpensive means of using this excitation method has been developed using silicon rectifiers for dc conversion. The system is flexible enough to be adapted to existing installations where other excitation schemes have been unsatisfactory, and equipment can be located where convenient.

At this stage of the investigation harmonic excitation appears to have a promising future, and units are being shipped to users. A harmonic winding can be added to a generator without any major increase in generator cost. In addition, because the harmonic winding is not connected electrically with the main generator winding, only standard excitation insulation levels are required.

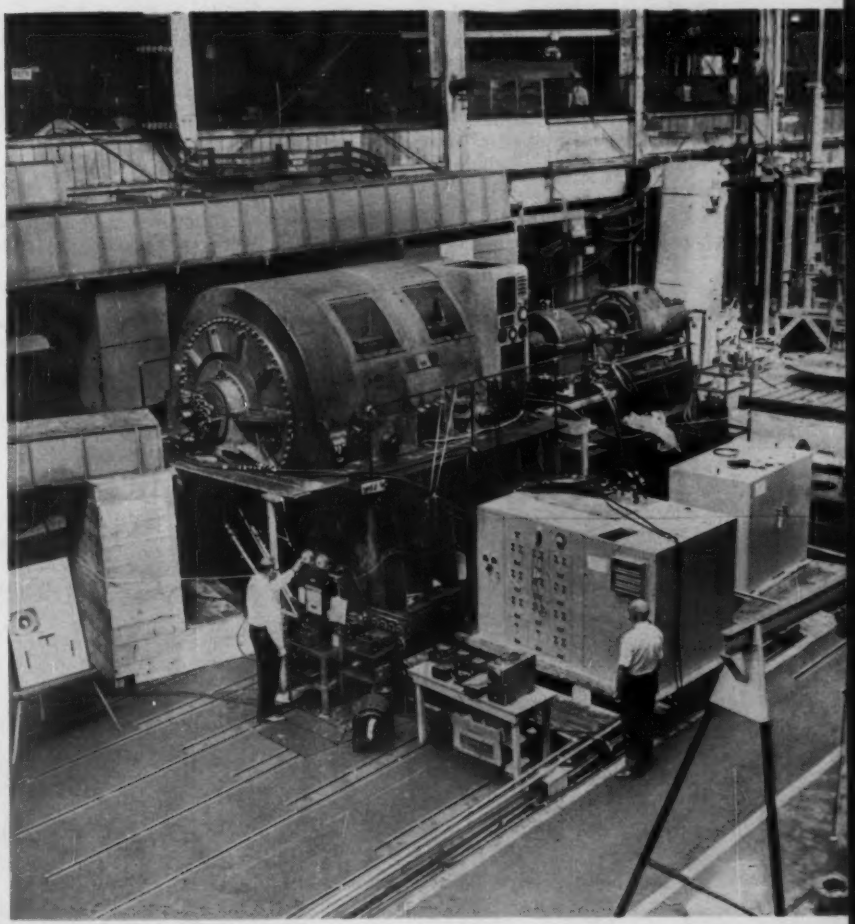
Flux Wave Contains Harmonics

The flux wave of all commercial synchronous machines consists of a fundamental plus varying amounts of all odd harmonics. Harmonics are present because of saturation of rotor teeth, rotor and stator slotting, and, in salient pole machines, the shape of the pole head. The generated voltage wave shape likewise contains these harmonics in varying amounts.

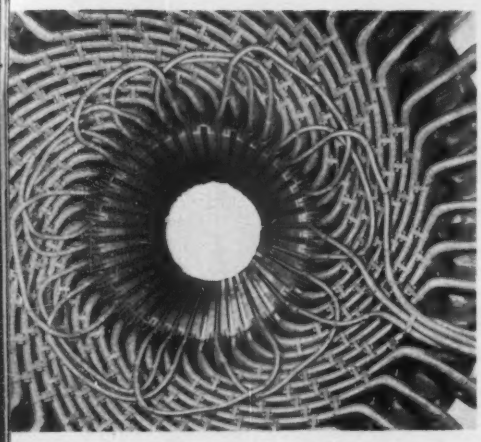
With 3-phase generation, the triplen (that is, third and odd multiples thereof) harmonic voltages, because they are in phase with each other in all phases, will cause no triplen current to flow between phases in the external circuit and, consequently, do no useful work unless a 4-wire system is employed. If a portion of these triplen harmonics in the flux wave can be converted to useful power in a separate stator winding, then this power is gained without any additional excitation requirement of the main generator field.

Such a winding can be constructed in any machine whose stator is so slotted that it will accommodate a balanced additional stator winding of as many poles as the order of the harmonic times the poles on the rotor. This winding will cancel out fundamental frequency components and all harmonic voltages except those of the particular harmonic and odd higher order multiples of this harmonic. It is, of course, also possible to construct harmonic windings which are not balanced, but these will not cancel out all traces of fundamental or undesired harmonics.

To prove the feasibility of harmonic excitation, tests were made on several machines, including a salient pole synchronous motor and non-salient pole turbine generators with various rotor winding configurations and stator winding connections. The harmonic voltage and power available were found to be functions of both of these considerations. However, the tests proved that sufficient voltage and power could be obtained from a properly



TEST MACHINE set up at Elliott Co plant has undergone steady-state loadings at open circuit and zero power factor, plus various transient response tests



HARMONIC WINDINGS are shown entering at right. They are easily installed on existing machines, and the addition involves no increase in machine size or appreciable cost increase

designed harmonic winding to self-excite the generator.

A harmonic winding and excitation system was then designed for a 25.6-Mva commercial generator. No changes in the design of the standard generator were required except for the addition of a harmonic winding. By using a digital computer, engineers selected harmonic winding connections to obtain a balanced set of 3-phase triplen harmonic voltages while minimizing build-up of unwanted voltages of fundamental and other harmonic frequencies.

The control system is composed of a standard Elliott static voltage regulator, a push-pull magnetic preamplifier, a power magnetic amplifier including silicon rectifiers and necessary protective devices. Static voltage regulating equipment and the magnetic preamplifier are mounted in a standard voltage regulator free-standing cubicle. Saturable reactors and power rectifiers are mounted in a second cubicle.

Included in the excitation cubicle in addition to the power magnetic amplifier is a static manual control circuit, a current limiting fuse in each parallel rectifier branch of a 3-phase bridge, and a non-linear resistor to reduce surge voltages.

Rectifiers are sized to operate full capacity with one branch in each of the three phases out of service. In the event of failure of a rectifier, the current limiting fuses will isolate the faulty rectifier and permit its replacement with an auxiliary assembly without affecting system performance.

Negative currents that may be induced from the generator field will be absorbed by a non-linear resistor connected across the field winding. Positive induced field currents such as may occur under fault conditions will be carried by the rectifiers themselves.

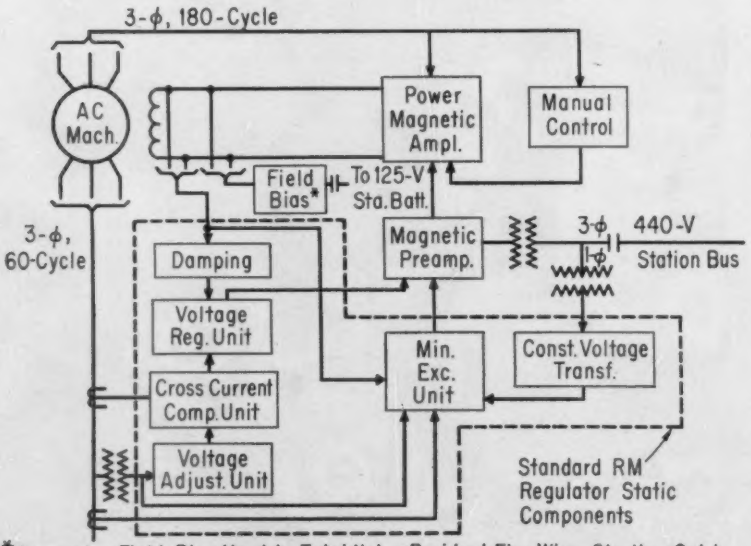
The manual control circuit provides a means for control of the generator voltage independent of the voltage regulator and any external source of power. Under manual control, the operator can adjust generator voltage by positioning a small hand-operated rheostat mounted remotely on the operator's control board. A particular rheostat setting will hold generator voltage constant for a particular load and power factor.

Constant Voltage Maintained

With the voltage regulator in operation the generator voltage is automatically maintained constant within $\pm\frac{1}{2}\%$ for all loads and power factors within machine capability and with all compensating and limiting circuits disconnected. Because the rising characteristic of the harmonic voltage with load closely parallels excitation requirements, very little action is required by the regulator to maintain the voltage at a constant value. The voltage regulator is required, however, to reduce system response time under sudden load changes and to trim the action of the rising harmonic voltage characteristic.

As the magnitude of residual harmonic voltage is negligible, a generator field bias circuit is required for initial excitation. Power is provided by a 125-v station battery to insure the availability of excitation power for start-up in an emergency. Once the start switch is operated, the field bias provides excitation power until generator open-circuit voltage rises to about rated value, when a smooth transfer to self-excitation automatically occurs. As the whole process occurs in less than 10 sec, current drain on the station battery is negligible.

Because of the power capability of the ac generator with respect to factory test equipment, load tests will not be made until the equipment is installed in the field. Tests to date with the generator self-excited include steady-state loadings at open circuit and zero power factor and transient response under various conditions, including 3-phase short circuit.



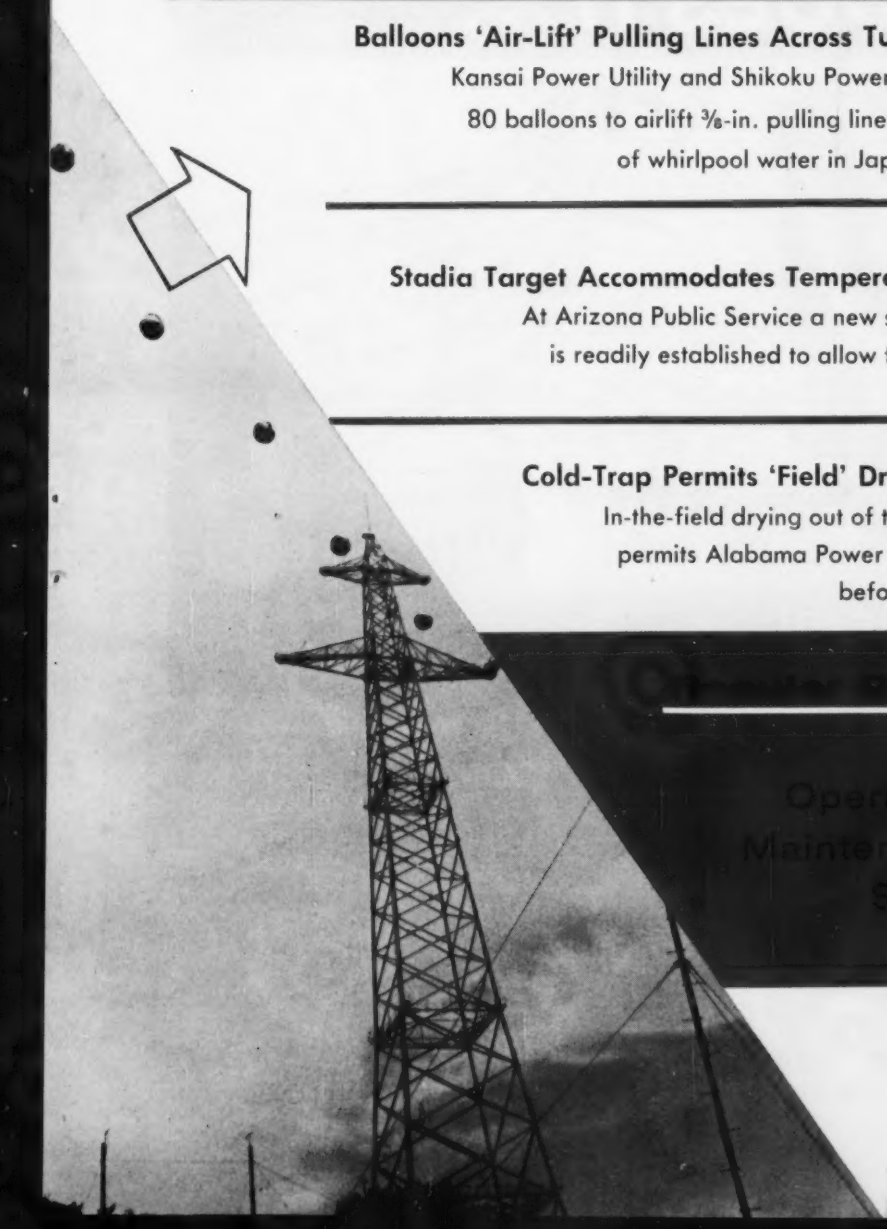
AUTOMATIC CONTROL SYSTEM includes manual control circuit to provide a control independent of the voltage regulator and external power sources

Electrical World Report

JULY-AUGUST 1961

ELECTRIC utility methods

CONSTRUCTION • OPERATION • MAINTENANCE



Balloons 'Air-Lift' Pulling Lines Across Turbulent Naruto Straits
Kansai Power Utility and Shikoku Power Utility companies harness 80 balloons to airlift ⅜-in. pulling line across a mile-wide stretch of whirlpool water in Japan's Tokushima Prefecture — p 65

Stadia Target Accommodates Temperature during 'Sagging'
At Arizona Public Service a new setting on the stadia target is readily established to allow for changes in temperature — p 68

Cold-Trap Permits 'Field' Dry-Out of Transformers
In-the-field drying out of transformers up to 350 kva permits Alabama Power Co to inspect all new units before placing them in service — p 66

Construction — p 70
Operation & Testing — p 78
Maintenance & Repair — p 88
Stores & Shops — p 94
Safety — p 96

New Equipment — p 53
Manufacturers Literature — p 98

EASY DOES IT...

with the right lubricant for each cable-pulling job

Save time and money installing cable in conduit . . . protect cable from damage . . . assure service continuity . . . with a cable lubricant engineered for your job's requirements.

Because conditions vary from job to job—diameter and length of cable, kind of insulation, number of bends, friction in the duct—Burndy provides these **four** tested cable lubricants, for a variety of service conditions. One of the four is the Burndy lubricant for your job . . . ask Burndy to help you select the cable-pulling lubricant you need.

Burndy SLIKON, for cable covered with rubber, many kinds of plastic, or lead, for installation in steel or aluminum conduit.

Burndy ALBENTONITE CABLE LUBRICANT, for cables with polyethylene and similar insulations.

Burndy IMPROVED CABLE PULLING COMPOUND, specifically for lead-covered cable for installation in ducts of all types.

Burndy PROTECTANT 626, for lead covered cable for installation in ducts and manholes subject to flooding and other severe conditions.

BURNDY

61-19

NORWALK, CONNECT. BICC-BURNDY Ltd. Prescot, Lancs., England In Europe: Malines, Belgium TORONTO, CANADA

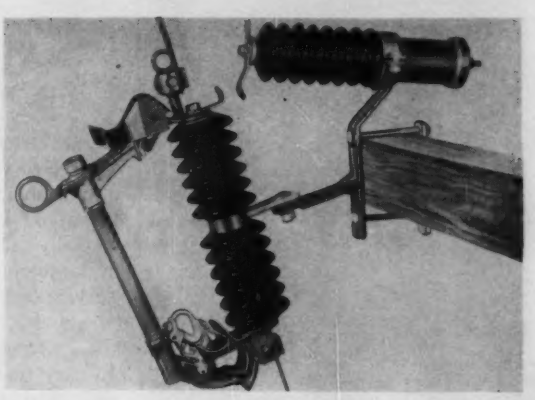
To obtain more information on these items, use code numbers indicated for the items when filling in Reader Service Card

ELECTRIC UTILITY METHODS

EUM NEW EQUIPMENT

Cutout Arrester Combo . . .

. . . consists of open-type distribution cutout mounted with an externally-gapped, valve-type arrester. Any one of five cutouts, rated 7.8, 15, or 27 kv, may be specified. These are available in the expendable cap BV-33-F or single-vented SV-33-F; the extra heavy-duty BV-33-G; the BV-33-J or SV-33-J equipped with hooks for use with a load-break tool. Arresters rated 9, 10, 12, 15 or 18 kv are also offered. Cutout arrester combinations are supplied for mounting on either crossarms or poles, with the arrester mounted vertically or horizontally. A two-piece bracket is supplied which permits the cutout to be swiveled in either direction as much as 45 deg. The arrester can be assembled either to the right or left of the mounting bracket on all arrangements where the arrester is vertical.
Southern States, Inc, Hampton, Ga.



All-Purpose Truck Body . . .

. . . is for general-service utility use. Body dimensions of the ¾-ton HSB90 model are: 90 in. long, 77½ in. wide, 42 in. over-all height, 29 in. from floor to top. Depth of side boxes is 14½ in. and inside floor space is 90x48½ in. The floor is made from 14-gage tread plate steel, anchored to four formed crossbearers of 10-gage steel, and is further reinforced with longitudinal support members of 16-gage steel. There is a hinged tail gate with chain and hooks for positioning and locking. Sliding-type roof and ladder racks are optional.
Highway Trailer Industries, Inc, Stoughton, Wis.

Pole-top Transformer . . .

. . . features cover-mounted, high-voltage bushings radially oriented from the pole with low-voltage bushings located at the base of the transformer. It is reported the new design will effect savings in installation and service and will offer a greatly improved appearance when cluster mountings are necessary. High-voltage leads are away from the pole; secondaries are as far from high-voltage leads as possible. Less heavy wire is required in the secondary leads and separating the primary from the secondary is said to afford much greater safety. The new units will be available in ratings from 10 kva through 167 kva. Any of three basic types may be selected: SW, an extremely low-loss unit; WA-65, which are said to exceed industry standards slightly; or CWA for systems with moderate overloads, but transformer peak is not coincident with system peak.
Standard Transformer Co, Warren, Ohio

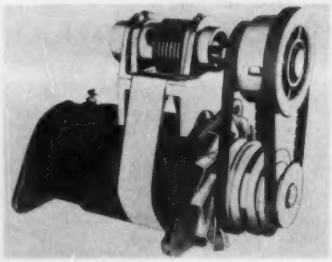
(More New Equipment on page 54)

Call Graybar for improved Klean-Kote Orangeburg® Fibre Conduit

Improved Klean-Kote Orangeburg Fibre Conduit has a tough, protective coating for clean, irritation-free handling. Klean-Kote travels and weathers better, and joints are better than ever. Always specify Klean-Kote Orangeburg conduit for fastest joints...prolonged cable life. Ask Graybar for 8-page descriptive catalog. It's another reason to call Graybar—for everything. Graybar Electric Co., Inc.: local service to utilities through coast-to-coast warehousing.

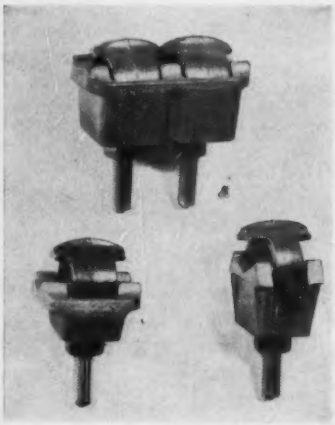
GraybaR

631



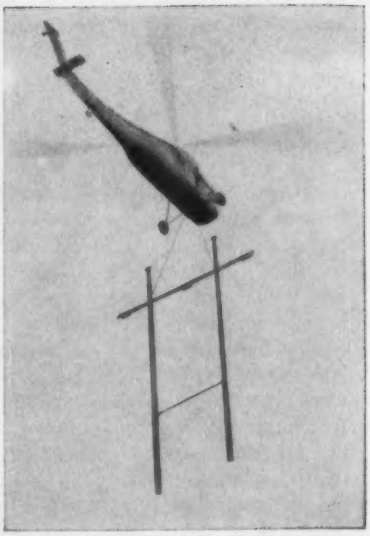
Generator Booster . . .

. . . furnishes constant battery charge to vehicles, saving battery replacement and maintenance costs. It is reported to be especially valuable for users of radio-telephone equipped cars, service trucks and vehicles which spend much of their time idling. The overdrive can be attached to any standard generator and will step up generator rotation at low engine speeds. When vehicle speed reaches 25 mph, the overdrive automatically disengages to prevent overcharging. Spring-loaded neoprene clutch shoes assure reliable performance of the assembly.
E. I. du Pont de Nemours & Co, Inc, Wilmington 98, Del. (4)



Tap Connectors . . .

. . . link cable to aluminum or copper buses, spades or contact pads of transformers, switches, or switchgear enclosures. The line of LS and LSN single tap and LD one-way or two-way eyebolt tap connectors, for NEMA drilling, is said to feature compact-



Keeping Pace with Progress —

Haley's

uses the most modern plants to produce

— Pentachlorophenol Treated —

WESTERN RED CEDAR POLES

and

DOUGLAS FIR CROSSARMS

Our modern treating and fabricating equipment, storage yards and shipping service means we can serve you better, faster than ever before.

Plants at
Bellingham, Washington
Minneapolis, Minnesota
and
Findlay, Ohio

R. G. HALEY & CO., INC.
Spitzer Bldg., Toledo 4, Ohio

CIRCLE 54 ON READER SERVICE CARD

CIRCLE 105 ON READER SERVICE CARD

Type **HAS** Suspension Clamp

NEVER DROPPED A LINE!

WHY ANDERSON SUSPENSION CLAMPS HAVE NEVER BEEN KNOWN TO FAIL...

How often do lines drop because of suspension clamp failure? Not very often... *but never with Anderson!* We have never had reports of a failure or a complaint of conductor strands damaged from the use of an Anderson suspension clamp.

Why? Because Anderson suspension clamps are job-designed by engineers who know the job to be done: Aluminum to prevent power loss and heat buildup . . . Scientifically weighted, balanced and shaped to protect the conductor strands from chafing and vibration damage... Exclusive anti-rotation clevis pins to prevent clamp wear . . . Easily worked "hot" . . . Made with a special casting process which gives greater strength with lighter weight by eliminating single directional grain structure patterns, typical in forgings.

As a result, Anderson's suspension clamps have an enviable record of trouble-free performance. For convincing proof, check the brands of aluminum clamps in service on your transmission system... chances are better than 50/50 that they were manufactured by Anderson. For complete details contact your Anderson Representative or write Anderson Electric Corporation, Leeds, Alabama.

ANDERSON ELECTRIC CORPORATION

Research/Quality/Performance/in Aluminum and Bronze Products

CIRCLE 55 ON READER SERVICE CARD

BARTLETT TREE TRIMMING TOOLS

No. 1-WSQ (Square End Mount) Pulley Type Tree Trimmer

Because of demand for a tree trimmer head designed for mounting on a square end pole, we have produced a one-piece hook having a box-like shank so as to accommodate our 1¼"x1⅛" rectangular poles. This type supports the pole on three sides, permitting quick, easy assembly to a square end pole.

The operating parts are the same as used on our No. 1-W Pulley Type Tree Trimmer, and are interchangeable.

This design retains the full strength of the pole at the point of greatest stress, and, for added ruggedness, we fit this tool with our Laminated Sitka Spruce poles.

Drop Forged Lopping Shears

No. 777 TWO HAND PRUNER with 10" strap ferrule. Also made with 4" plain ferrule.

This Two Hand Pruner has a rugged drop forged blade and hook of hardened tool steel fitted with 28" white ash handles and steel ferrules to make this a light weight, rapid cutting tool of exceptional durability. Also makers of the popular "WE" Combination Pruner and Saw with wire raising tool and test pike which fit into a common handle made of Sitka Spruce and furnished either 4-ft, 6-ft or 8-ft in length with extra sections available.

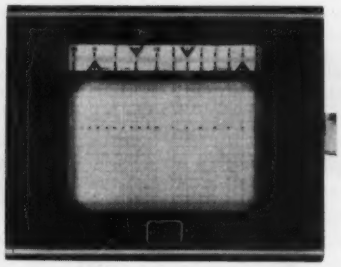
Write for new catalog listing all Bartlett Tree Trimming Tools and Tree Surgery Supplies.

BARTLETT MFG. COMPANY

3048 E. Grand Blvd.
Detroit 2, Michigan

ness and wide range. Types LS and LSN also are designed to permit mounting four connectors on a standard 4-hole NEMA drilled pad to accommodate cable sizes up through 1,000 MCM cable. Type LD double-basket eyebolt terminal is designed with ½-in.-dia bolts on 1¾-in. centers which meet 2-hole NEMA pad application. Connectors cover the full range of cable sizes from No. 10 solid through 2,000 MCM cable. They permit clamping up through a ¾-in.-thick pad or structural member.

Penn-Union Electric Corp, Erie, Pa. (5)



Recorder . . .

. . . compares four simultaneously recorded variables on a time basis. The four-pen electronic Dynamaster recorder is said to be four instruments in one case. It will record any set of variables that can be transduced into an electrical quantity. Each pen has its own motor-driven balancing unit; therefore, there is ample torque available for auxiliary functions—such as retransmitting slidewires and alarm contacts.

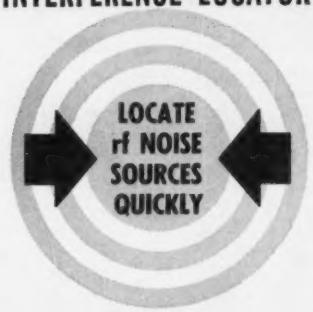
Bristol Co, Waterbury, Conn. (6)

Miniature Recorder . . .

. . . provides a legible, permanent voltage record on moving paper tape which is smudgeless, pressure-sensitive and not affected by heat, cold, moisture, humidity or fumes. The Recorder Voltmeter weighs only 20 oz and is $3\frac{1}{16}$x$5\frac{5}{8}$x$1\frac{1}{16}$ in. in size—only slightly larger than a panel meter. The unit features sensitivity, simplified paper loading, and an expanded scale. Paper is fed at a

SPRAGUE®

MODEL 500 INTERFERENCE LOCATOR



This versatile instrument is a highly sensitive interference locator—*with the widest frequency range of any standard available unit!* Model 500 tunes across the entire standard and FM broadcast, shortwave, and VHF-TV spectrums from 550 kc. to 220 mc. in 6 bands.

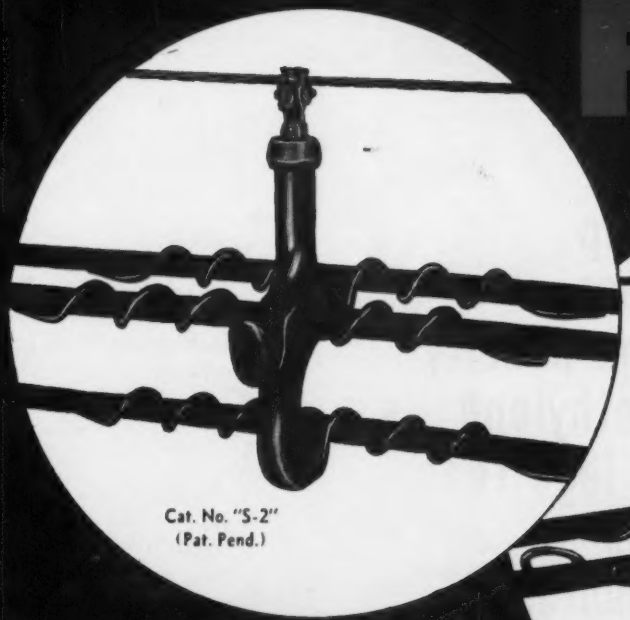
It's a compact, portable, rugged, versatile instrument—engineered and designed for most efficient operation *in practical field use.* It features a transistorized power supply, meter indications proportional to carrier strength as well as sensitivity of 5 microvolts minimum for 5% meter deflection over entire tuning range.

For full details, send for brochure IL-106.

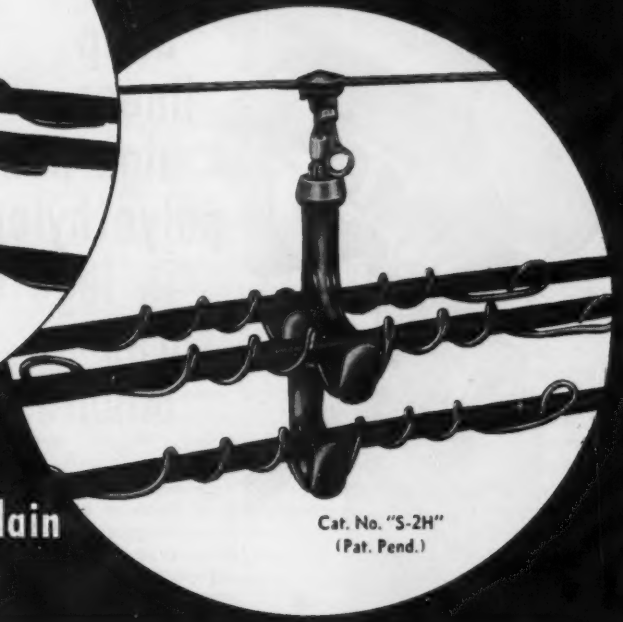
SPRAGUE ELECTRIC COMPANY
315 Marshall Street, North Adams, Mass.

SPRAGUE®
THE MARK OF RELIABILITY

Another FARGO FIRST



Cat. No. "S-2"
(Pat. Pend.)



Cat. No. "S-2H"
(Pat. Pend.)

"S-2" SPACERS
. . . dependability of porcelain
. . . ease of installation

1. FIRST with wet process porcelain's proven weather resistance, long term dielectric strength, and self-cleaning for lifetime dependability.
2. FIRST with a spacer that can easily be installed with "hot sticks" without service interruptions.
3. FIRST with specially designed swivel action hardware which is ideal for grade and corner construction and, also, relieves stress on the spacer.
4. FIRST with high gripping power non-conductive tie wires to eliminate mechanical and electrical stress on the cable covering.
5. FIRST with a spacer that does not require special grommets to handle or stock for each size cable.

1. PLUS, just one unit with 6" on center spacing for 5 or 15 KV for cables from ¼" to 1½" diameter.
2. PLUS, wet and dry flashovers and RIV levels compatible with 15 KV systems.
3. PLUS, mechanical strength to support loads in excess of 2500 pounds and withstand the forces of faults well over 10,000 amperes.
4. PLUS, BIL values in excess of the published standard for 15 KV equipment, even with punctured cable.
5. PLUS, diamond configuration of the conductors for safe, easy access to each phase.

Ask your Line Material Field Engineer for complete details.

Distributed by
LINE MATERIAL INDUSTRIES
McGraw-Edison Company
Milwaukee, Wisconsin
In Canada, CLM INDUSTRIES, Toronto 13, Canada

Manufactured by
FARGO MFG. COMPANY, INC.
Poughkeepsie
New York

FARGO

Strip linear high-density polyethylene in less than three minutes!

Designed to remove plastic covering from copper or aluminum conductors in a matter of minutes, the new Ellis Line Stripper* is easily pushed over the covered conductor. Hot, dull blades cut the covering and in less than three minutes when the tool is removed, the covering is stripped, leaving the line prepared for a tap or a splice.

The new Ellis Line Stripper is a self contained unit weighing less than eight pounds with propane tank attached. The Long Island Lighting Company, seeking a solution to the problem of stripping high density linear polyethylene, participated in the development of this new tool. Expected annual savings are substantial! Use coupon for complete engineering data!

SINGLE KIT, less propane tank **$99.50**

**Patents pending*

EDELLIS/ENGINEERING

155 TWIN LANE NORTH, WANTAGH, NEW YORK

☐ Please send data sheet by return mail

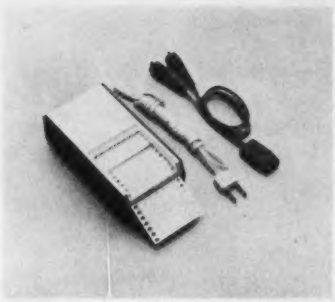
☐ Please arrange for a demonstration

NAME_____ TITLE_____

COMPANY_____

ADDRESS_____

CITY_____ STATE_____

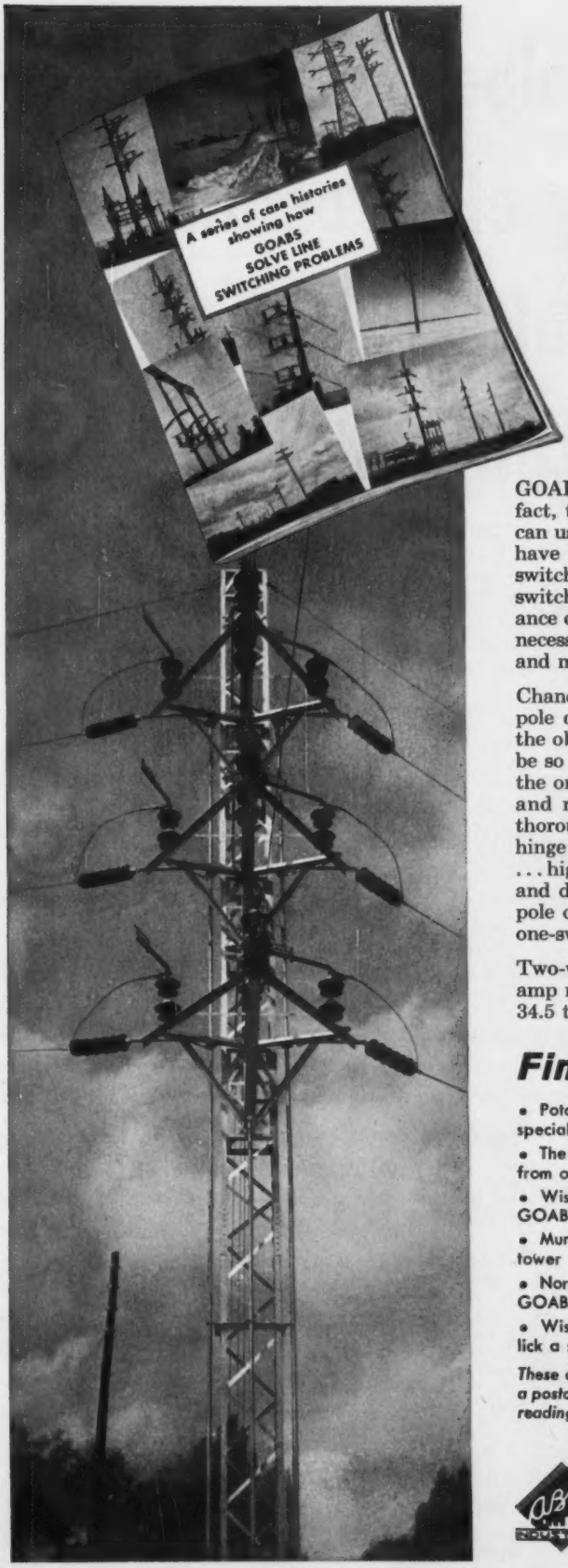


speed of 12 in. per hr. The recorder comes with a leather carrying case, line cord and test probes. Two models are available: regular scale, 0/150/300/600 VAC; and with an expanded scale (for increased accuracy), 95 to 130, 190 to 260 VAC.
Amprobe Instrument Corp, Lynbrook, N. Y. (7)

Safety Visor . . .

. . . guards against eye injuries from flying fragments and momentary sun blindness. The Flip-Up Visor is easily attached with snap clips to the brim of any style hard hat or cap. Constructed sturdily of 0.030 acetate, bound on edges, it is available in clear or green. Adjustable for proper distance from the wearer's face, the visor is mounted on a swivelling ball joint—permitting it to be swung up under the hat brim when not needed.
Davis Emergency Equipment Co, Newark, N. J. (8)

(Continued on page 62)



Chance

GOABS do solve many Line Switching Problems

GOABS are not just problem-solving specialty switches. In fact, they are the most efficient and economical means you can use for any tap switching arrangement. But many users have found them particularly valuable in solving specific switching problems like right-of-way restrictions; need for switch controls at one location; demand for improved appearance of lines, less clutter with fewer equipment installations; necessity of making provisions for future expansion of circuits and many others.

Chance GOABS phase above phase installation on a single pole or supporting structure for 1, 2 or 3-way switching is the obvious answer to such problems. Benefits that may not be so obvious without careful checking and comparison are: the one piece welded aluminum frame designed for strength and rigidity so necessary for smooth switch operation, thoroughly tested and field proven . . . sealed silver to silver hinge contacts . . . high pressure straight line jaw contacts . . . high speed arcing horns . . . maintenance free bearings . . . and direct-operating vertical control rods easily located for pole clearance without universal joints that impede smooth one-swing opening or closing.

Two-way and 3-way GOABS are available in 400-600-1200 amp ratings, 7.5 to 69 KV; 1-way in 600-1200 amp ratings, 34.5 to 69 KV.

Find out how...

- Potomac Electric Power Company simplified switching operations in special installations with GOABS.
- The city of Watertown, S. D. used GOABS to provide 3-way switching from one convenient location.
- Wisconsin Power & Light Company cut switch installation costs with GOABS.
- Municipal Public Utilities of Brownsville, Texas installed an aluminum tower and 3-way GOABS (shown at left) in a single day.
- Northern States Power Company plans for future expansion with GOABS.
- Wisconsin Power & Light installed a 1-way GOABS "in a corner" to lick a space problem.

These case histories (and more to come) are yours for the asking. Just write a postcard or letter for "GOABS Case Histories." You'll get some profitable reading. Address:

A. B. CHANCE CO.
CENTRALIA, MISSOURI
(A. B. Chance Company of Canada, Ltd., Toronto)

CS61-14

Wet flashover values increased 20% by electrostatic rain deflectors on Lapp Station Posts

As operating voltages increase, heights of station insulators increase correspondingly. And as heights of insulator stacks go up, the tendency increases for lower insulators to flood under heavy rain conditions.

A Lapp development (Lapp Patent No. 2884479) is the electrostatic rain deflector. This is a metal plate located at each bolted joint between component insulators. It uses the electrostatic field surrounding the insulator to disperse the water as it flows down from the upper portion of the insulator, throwing it outward and eliminating flooding over the lower portion. In tests, Station Posts with the electrostatic rain deflectors show 20% increase in wet flashover characteristics over Posts without these devices.

In addition, design of these deflectors cooperates ideally with the principle of Lapp Fog Type leakage surfaces. Small in diameter, the rain deflectors permit insulator surfaces to be wetted all over without imposing dry shielded areas where leakage current can quickly cause sparking; yet under rain will prevent excess flow of contaminated water over lower sections.

For all high-voltage, EHV, and contemplated EHV, Lapp Station Posts offer superiorities in rigidity, ease and simplicity of construction, adaptability for use inverted or horizontally, operation under dirt conditions, and dependable long life. Units (with Lapp electrostatic rain deflectors at *every* bolted connection) are available in three strength classes at ratings of 900 BIL, 1050 BIL; in two strength classes at 1300 BIL, 1470 BIL, 1640 BIL, 1800 BIL and 2100 BIL. Write for Lapp Brochure No. 548—a critical examination of station insulators for high-voltage application.

Lapp Insulator Co., Inc., Le Roy, N. Y.

Lapp

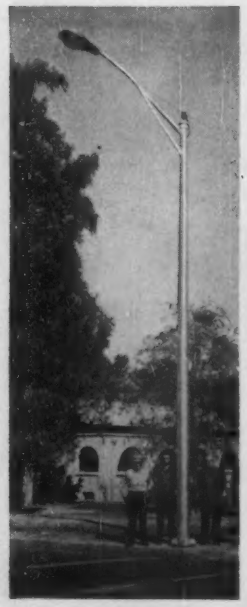
CIRCLE 60 ON READER SERVICE CARD

PROOF
FROM THE LABORATORY

This 1050 BIL (230 kv operating rating) Lapp Station Post was photographed through a telescope at 25 kv intervals through buildup of 60-cycle voltage to flashover. The frames selected are at multiples of operating voltage, and show how water is thrown off by electrostatic force.

WHAT A DIFFERENCE!

What a beautiful difference P & K ALL-ALUMINUM LIGHTING STANDARDS can make in any community

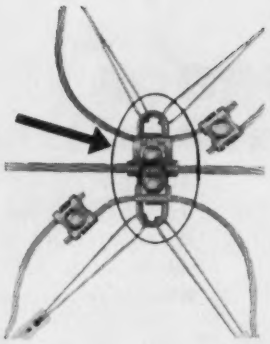


You're looking down Broadway, the main business street of Needles, California. Ordered by the City Council as part of a relighting program, the installation, made by the California-Pacific Utilities Co., consisted of twenty seven P & K 30 foot tapered aluminum lighting standards. As you can see from the photos above, the difference is immediately apparent. The result is greater safety for the community at night and the beautiful modern appearance of the new standards by day. Of course, no painting ever required. Why not write for P & K's new brochure ALS-5 for a wealth of helpful information in your street lighting plans.

P&K

PFAFF & KENDALL
84 Foundry Street, Newark 5, N. J.

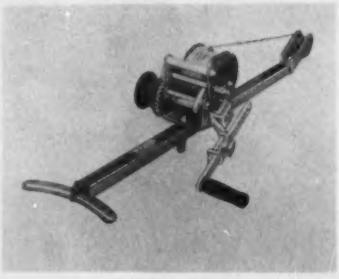
Branch Sales Office: San Jose, California
In Canada: Powerlite Devices LTD., Toronto, Montreal, Vancouver
Export Representative: Philips Export Co., N. Y., N. Y.



Neutral Span Clamp

. . . doubles as a parallel groove connector for aerial cable neutral and as a dead-ending clamp accommodating up to four service drops. The Type MS one-piece clamp is cast in high-strength aluminum alloy, with galvanized-steel hardware. All four taps need not be made at the time of installation; they may be installed later, independent of existing conditions.

Jasper Blackburn Corp, St. Louis 14, Mo. (9)



Portable Wire Puller...

. . . has five major improvements over the Porta-Puller No. 1, introduced last year. These features are: a stronger frame; a double reduction winch; newly designed, heavy-duty bearings; double, extra-strong pulleyhead and a stronger supporting stub. The hercules Porta-Puller comes equipped with 200 ft of cable and is geared for pulls with *either* rope or cable. However, by using the new extra attachment, the Bull Wheel, the unit can make pulls of both rope and cable.

Fairfield Industries, Caldwell, N. J. (10)

Compression

DISCONNECTS

are now

Quicker . . . Easier

HOT or COLD

Faster— it's self-keying. Tongue spots into position instantly for clamping.

Easier— only 2 units. Nothing that can fall. Big improvement over disconnects with 5 or 6 loose parts.

Better Contact— Flat aluminum to flat aluminum, large contact area.

Write for a demonstration, or description.

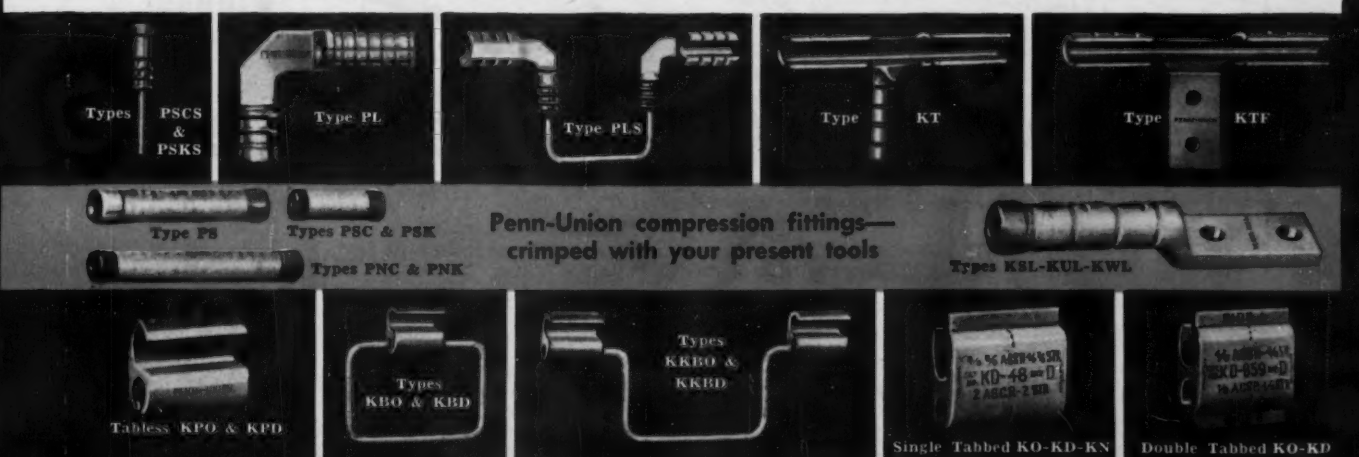
PENN-UNION ELECTRIC CORP., Erie, Pa.

Export Sales—Philips Export Co., 100 East 42nd St., New York 17, N.Y.

PENN-UNION
a good connection

SOLD BY LEADING ELECTRICAL DISTRIBUTORS

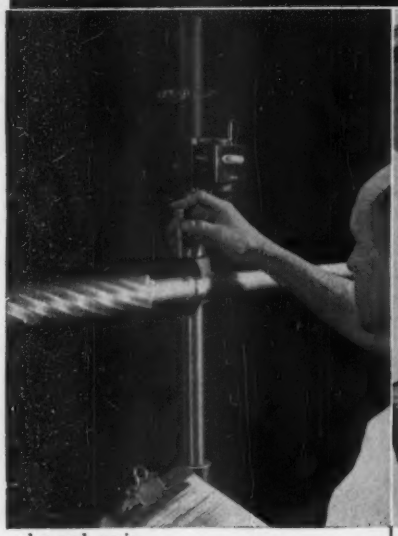
CIRCLE 63 ON READER SERVICE CARD



Your best conductor protection is **ARMOR RODS**
and the best armor rods are

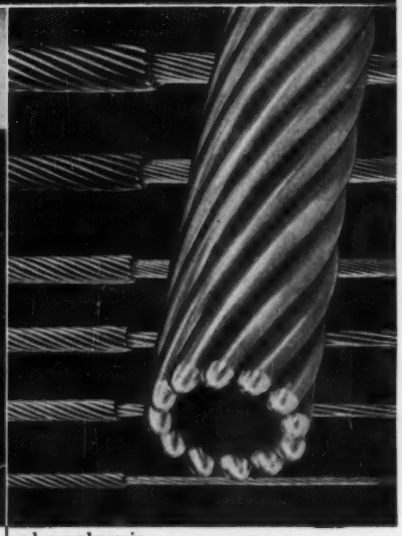
FANNER Superforms*

SUPERFORMED BY THE WORLD'S FIRST MAKER OF MACHINE-MADE ARMOR RODS



plus values in
RESEARCH/DEVELOPMENT
Punishing tests, indoors and outdoors, are constantly conducted for product improvement and new developments.

plus values in
RAW MATERIALS
Exacting tests and material inspection assure the finest quality in all Fanner Superformed products.

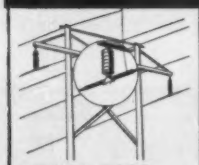


plus values in
PRECISION MANUFACTURE
Scrupulous care in manufacturing, in testing, in handling and in packaging assure on-the-job dependability.

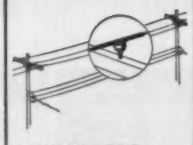
Of course you use armor rods for their economy and safety in construction, maintenance and repair of overhead lines. But, above all, you buy them because they are the most *dependable* accessory yet developed for protecting overhead conductors against wind-induced vibration at supporting points.

Fanner Superforms are of the highest quality. At every step . . . in development, materials, manufacture and packaging . . . Fanner takes extra care to give you the finest armor rods available, *at no extra cost*. Ask our representative for details. He will give you *plus assistance with your T & D problems*, too!

A FEW FANNER Superforms AND FINEST PLASTIC PRODUCTS

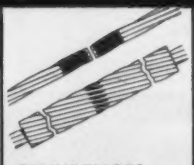


ARMOR RODS
. . . Protect long spans at supports



LINEGUARDS
. . . Protect short spans at supports

FANNGRIPS
. . . For dead-ending strands or conductors



FANNSPLICES
. . . For joining or patching strands

TREEGUARDS
. . . Protect conductor surface covering

KOVER-GARDS
. . . Protect surface-mounted conductors

*A superior forming method in accordance with Patents No. 2,769,478 and 2,588,663—other patents applied for.

THE FANNER MANUFACTURING COMPANY
Brookside Park • Cleveland 9, Ohio

DIVISION OF TEXTRON, INC.

Fine Fanner Superformed Products

A-3605A

ELECTRIC UTILITY METHODS

Eum

FEATURE SECTION

Balloons 'Air Lift' Pulling Line Across Turbulent Straits

Approximately 80 balloons, each about 9 ft in dia, were harnessed recently by Japanese utility engineers to air-lift a 9-mm (about ⅜ in.) pulling line across a mile-wide stretch of the Naruto Straits to power-link Shikoku with Awaji Island in the Seto Inland Sea. The balloon method achieved the actual stringing of the cable in about two hours—but of greater significance, it circumvented environmental problems which precluded the use of conventional boat stringing routines, helicopter assists, or laying a submarine cable.

The $1.4-million project, built by the Kansai Electric and Shikoku Electric Power companies, will transmit 30 Mw at 170 kv to Awaji Island this fall.

The topography of the Naruto Straits near Kobe in Tokushima Prefecture precluded the use of helicopters. Also, the need to keep the channel open to shipping eliminated conventional river-crossing routines, as only short interruptions to channel traffic were permissible. Dangerous sea currents precluded laying submarine cable.

Preparatory to the actual pulling line-stringing operation, pulling and payoff reels and tensioner machines were located at their respective shore locations; 9 and 12-mm cables were reeved through traveling blocks mounted atop the Awaji and Naruto towers, respectively. Each wire was then brought down to its respective water-edge work-site. Finally, inflation of the first group of balloons began.

The balloons, rented for the occasion from a firm in Osaka for $2.78 per balloon per day, inflated to 8.9-ft dia, had a volume of 32 cu ft, and a lifting capacity of about 16.5 lb per balloon. Although it was planned to use up to 90 balloons, only about 80 were required to fly the approximately 5,900 ft (1,050 lb) of cable some 65 to 120 ft above ocean vessels proceeding through the straits.

At 11.30 am when the current, normally running at about 12.5 mph, reached its lowest speed, a tug carrying one end of the 9-mm pulling line started out from the Awaji shore. As the boat moved out with the wire, construction workers on shore attached inflated balloons at 65-ft intervals. The tug progressed out toward mid-channel taking with it the end of the 9-mm wire, with the trailing length of wire floating above the water.

CONSTRUCTION WORKERS attach inflated ballons (above) every 65 ft, to boat hauled pulling line (below)

AIR-LIFTED PULLING LINE spans Naruto (600-ft above sea level) and Awaji (530-ft) towers in Seto Inland Sea

When the tug approached the Naruto shore it was met by a second tug carrying the end of the 12-mm pulling cable. Near the Naruto shore, away from the turbulent waters of the straits, the two cables were spliced and then released—whereupon, approximately 80 balloons slowly lifted the 9/12-mm joined-cable above the Straits.

As the pulling line lifted upwards, the 9-mm section of the cable was gradually pulled back toward the Awaji side—the balloons were retrieved as the wire was brought in. When all the balloons were retrieved, the 12-mm pulling line spanned the towers.

It will be a routine task, using conventional tension-pulling equipment, to progressively increase the single 12-mm messenger wire until 35.5-mm, 170-kv cables are suspended between the two towers.

Cold-Trap Aids Dry-Out of Large Transformers

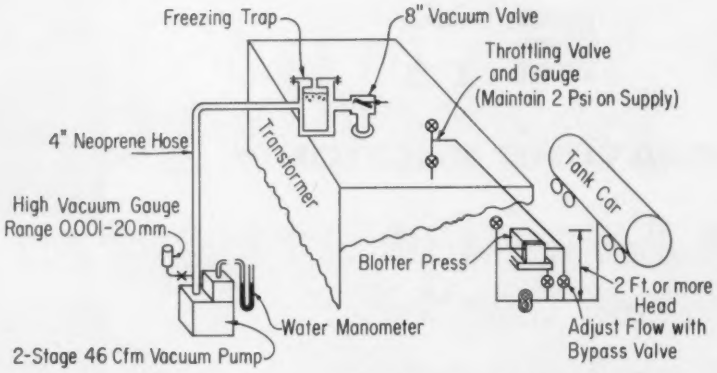
ROYCE L. MURRAY, Supervisor of Equipment, Alabama Power Co, Birmingham, Ala.

Alabama Power Co has developed an in-the-field "cold-trap" method of drying out large transformers, ranging in size from 10,000 to 350,000 kva. To date, over 3 million kva of new transformers have been processed, half of which are 230 kv. The field method of drying out transformers has innumerable advantages. Some of these are:

- The drying job is equal to, or better than, the factory job.
- The dryness of the transformer can readily be checked by noting the amount of water collected per unit of time, or by the vacuum reached, or both.
- The fact that a good drying-out job can be done easily makes it practical to open new transformers and inspect them for shipping damage before they are placed in service.

Drying out of transformers in-the-field is now part of the normal transformer maintenance procedure; further, field drying out is also a standard procedure for inspection and installation of a new transformer. Alabama Power Co always opens large transformers for inspection before the oil is in the tank.

In either case, when the tank is closed a pressure leak test is made using the General Electric H-1 leak detector. The tank must be capable of withstanding a high vacuum to a degree where the vacuum pump can exhaust down to the vapor pressure of the insulation.



FREEZE TRAP added to vacuum system makes practical the drying-out of large transformers in the field. Equipment at right refills transformers with oil

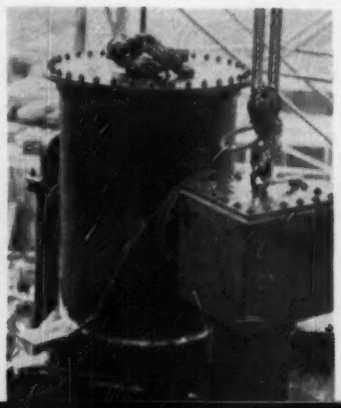
The method features a vacuum technique which uses an 8-in. inlet dry-ice acetone refrigerated cold trap that actually does the pumping of condensible vapors. This unit is backed up by a two-stage Kinney 46 cfm vacuum pump. The cold trap is usually mounted on a relief diaphragm-opening on the transformer cover and is connected to the mechanical vacuum pump. This pump, located on the ground, is connected to the cold-trap by a 16-ft length of 4-in.-neoprene barge-loading hose.

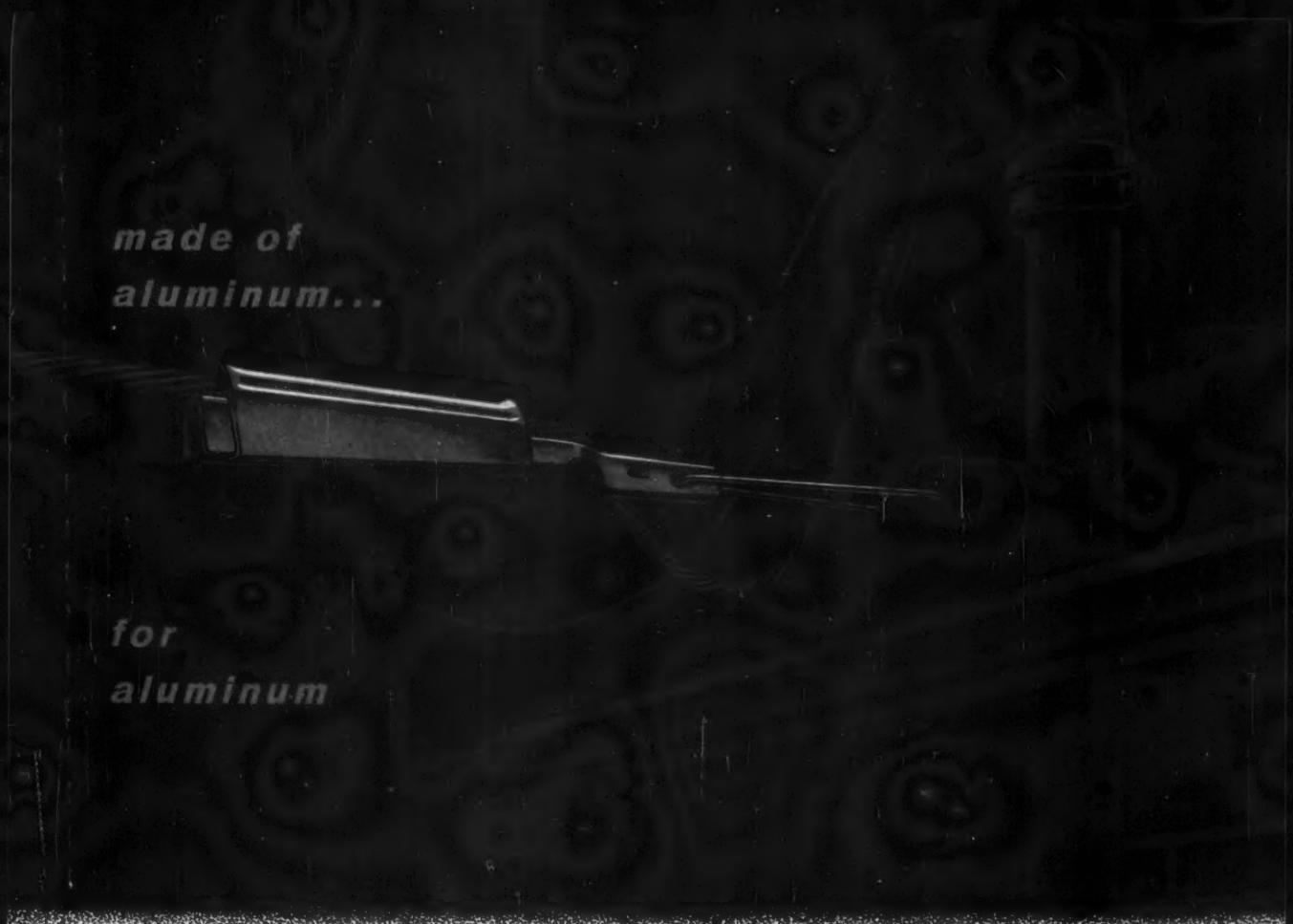
The schemetic of the equipment is shown above. The vacuum pump is allowed to run overnight, unattended. The cold trap, which is refrigerated by dry ice, freezes out condensible vapors. The next morning, the flapper-type 8-in. valve between the transformer and the cold trap is closed; the pump is stopped and vented; and, the cold trap thimble is inspected. Moisture, in the form of ice, is then scraped, melted off the outside of the thimble and weighed.

On the average, this drying-out process will remove about one-third the moisture present. In some instances as much as half of the residual moisture is removed during the initial 24-hour period. The degree of dryness finally achieved depends partly on how soon it must be put in service. If time permits, drying out is usually carried to the point where not more than 30 oz are removed on the last operation. Experience has shown that 3 to 12 gal of moisture is usually removed from a large new transformer.

The equipment required for this drying-out process is relatively inexpensive. The cold traps were built in Alabama Power Co shops. Holding 200 lb of dry ice, the vacuum spaces are insulated with aluminum foil. After the initial charge they use about 50 lb of dry ice per day.

BOLTED COVER of freeze trap permits easy inspection of thimble for ice accumulation. To determine the amount of moisture removed from the transformer, the ice is scraped from the thimble, melted and measured directly





ALL-ALUMINUM WEDGE CLAMPS

SERIES AA

eliminate bi-metal contact and galvanic corrosion
for stronger, longer lasting service dead-ends

Blackburn Series AA Wedge Clamps are designed and engineered for use with aluminum neutral messengers at service dead-ends.

Construction is heavy-gauge, high strength aluminum alloy. This aluminum-to-aluminum contact eliminates galvanic corrosion between dissimilar metals.

No need to thread the cable through the clamp. Because slider is removable, the clamp can be easily installed anywhere on a continuous run of conductor. Wedging action, as strain is applied to the neutral, grips tightly along the entire length of contact. Re-establishing proper sag is quick and easy.

Two types of bails available for easy installation: flexible strand with nylon jacket or rigid stainless steel, locked to wedge so it won't pop loose.

You can reduce inventory with this versatile series of clamps. Only four sizes will dead-end a range of cables from #6 solid through #4/0 ACSR.

Blackburn Wedge Clamps are also obtainable in chromated aluminum for highly corrosive atmospheres and in stainless steel for copper neutral messengers.

The entire line of Blackburn Wedge Clamps is available from your electrical distributor.

Jasper
BLACKBURN
Corporation

1525 Woodson Road • Saint Louis 14, Missouri

CIRCLE 67 ON READER SERVICE CARD

Temperature Chart For Stadia Target Simplifies Sagging Of Conductors

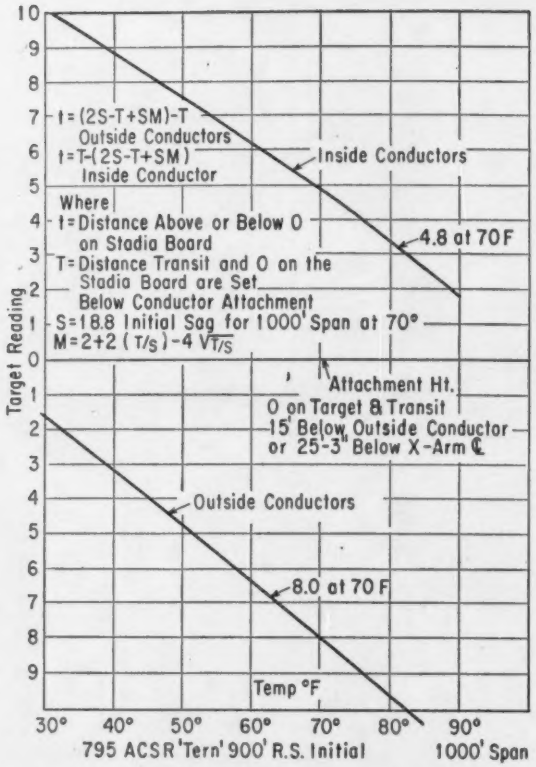
W. HANSON, B. FOEHNER, Engineering Services, Arizona Public Service Co, Phoenix, Ariz.

Sagging of transmission lines at any given environmental temperature is now readily accomplished by Arizona Public Service Co, using a temperature-stadia target board, in conjunction with settings picked off a pre-dawn temperature-factor chart. Furthermore, if the local temperature changes during sagging operations, a new setting on the stadia board may readily be established from the temperature-factor chart and sagging can be continued without delay.

Previously, when sagging conductors on Arizona PS Co's 230-kv transmission lines in northern part of the state, it was necessary, because of the "K" frame inclined-arm type of construction, to use two different transit and target set-ups to sag both outside and inside conductors. This situation together with the quick changes in temperature associated with this area made for difficult and time-consuming sagging conditions. It seemed that just as soon as the transit and target were located based on the then existing temperature and the conductor just about pulled to sag, the temperature would change—it would then be necessary to reposition the transit and target before sagging operation could be completed. This method, besides being slow and exasperating, also tended to introduce errors in the sagging job.

To resolve these problems a standard-type formula was used to calculate data for charting, transit and stadia settings through a range of temperatures—this data was then charted for field use in conjunction with a shop-fabricated stadia-type target board.

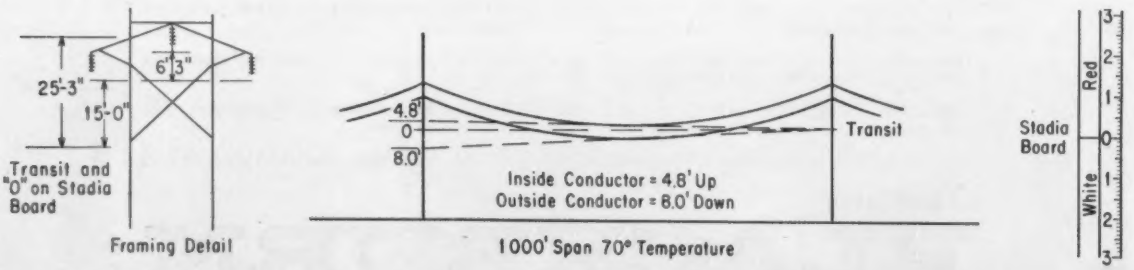
The Arizona PS target board, 24 ft long and 7 in. wide and of mahogany, was hinged in four sections for ease of carrying and storage. Large white cloth stadia tapes with black numbers and divisions were glued to the board with background above "0" reference painted red and background below "0" reference painted white.


t=(2S-T+SM)-T
Outside Conductors
t=T-(2S-T+SM)
Inside Conductor
Inside Conductors
Where
t=Distance Above or Below 0 on Stadia Board
T=Distance Transit and 0 on the Stadia Board are Set Below Conductor Attachment
S=18.8 Initial Sag for 1000' Span at 70°
M=2+2 (T/S)-4 √T/S
4.8 at 70 F
Attachment Ht.
0 on Target & Transit
15' Below Outside Conductor or 25'-3" Below X-Arm ℄
Outside Conductors
8.0 at 70 F
Target Reading
Temp °F
30° 40° 50° 60° 70° 80° 90°
795 ACSR 'Tern' 900' R.S. Initial
1000' Span

STANDARD-TYPE FORMULAE were used to calculate the charted settings, through a range of temperatures

With transit and stadia target in place, conductors are readily sagged at any given temperature, using target board and transit settings determined from the chart. Also, if temperature changes during sagging operation, all that is necessary is a new angle setting of transit as aimed at new setting on stadia board, the settings having been picked off the chart.

This method was also used at Arizona PS for the two overhead ground wires using a modified version of the previously described chart; also the stadia board was different in that it read only from the "0" reference line down. This type of chart may also be used when all three phase conductors are at the same elevation on structure.

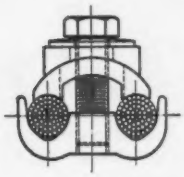


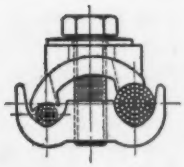
WITH TRANSIT AND TARGET in place, conductors are readily sagged at any given temperature, but more important new settings can be quickly introduced if temperature changes occur during the sagging operation

The DOSSERT exclusive All-New TRIPLEX

Transformer Tap Connector takes a wide range of Aluminum to Aluminum or Aluminum to Copper cable sizes...

... in both grooves, because it is self-leveling. The TRIPLEX line of transformer tap connectors is the final result of intensive research by DOSSERT engineers. The TRIPLEX combines the efficient electrical properties of a parallel groove clamp along with a high dielectric strength polyethylene insulating cover to form an easy-to-install, completely insulated connector.



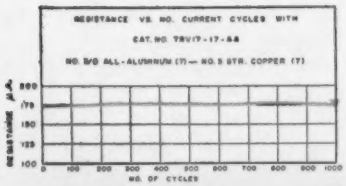


The TRIPLEX (type TRV) incorporates several unique features, that attribute to its high strength and extremely stable electrical characteristics.

1. A tangential plate, that receives the bolt clamping pressure and redistributes it uniformly over the arc of the clamping cap.

2. The tangential plate also establishes a flat surface perpendicular to the axis of the bolt for any combination of cable sizes. Perpendicularity is maintained even with connector holding a maximum cable in one groove and a minimum in the other.

3. To assure full clamping pressure during the thermal change caused by varying electrical loads, the connector has dish-shaped Belleville spring washers under the head of each bolt that permit expansion or contraction of the connector with constant spring loaded pressure on the clamping members.



TRIPLEX heat cycling test shows negligible change in resistance!

An established current level of 330 amperes drove the conductors to a minimum temperature of 125°C. The on-time was 20 minutes and the off-time 40 minutes. The curve shows negligible resistance change throughout the entire 1000 cycles.

Write for illustrated literature.

50 YEARS OF TECHNICAL KNOW-HOW

DOSSERT MFG. CORP.

249 Huron Street, Brooklyn, New York

Representatives in principal cities.

Distributed outside the U.S.A. and Canada by:

INTERNATIONAL GENERAL ELECTRIC COMPANY

Construction Materials and Lighting Sales

150 East 42nd Street, New York 17, N.Y., U.S.A.

ELECTRIC UTILITY METHODS

Eum

CONSTRUCTION

Portable 'Tower-Within-a-Tower'

LIGHTWEIGHT TOWER increases range of clear line-of-sight in hilly, mountainous, wooded terrain

A new collapsible, aluminum-alloy tower, — designed by the manufacturer in co-operation with the Ontario Hydro Survey Department—is making a significant contribution to the accuracy and efficiency of large-scale transmission surveys in Canada.

The lightweight tower, which supports survey instruments to increase the range of clear line-of-sight in hilly or wooded terrain, is low in first cost and eliminates the excessive installation costs normally associated with conventional field-erected scaffolds and platforms.

In the surveying of large areas or long distances a form of horizontal and vertical control is necessary to limit the errors normally encountered when using lower accuracy equipment, to pick up topographic and physical detail. The use of electronic measuring devices makes the layout of control more economical.

One of the difficulties of using electronic and optical equipment is the necessity of having a line of sight.

Early experiments using a pole-type suspension for a tellurometer system when required for azimuths and elevation did not prove successful.

To overcome this problem, the Ontario Hydro Survey Department listed a specification for a lightweight portable aluminum alloy tower-within-a-tower, to be used as a support for the survey instruments.

The first requirements were listed and stipulated an outer and inner tower. Each section could be no greater than 10 ft in length —in order to pass through the cargo door of the craft. The total weight had to agree with the carrying capacity of the Beaver or Norseman aircraft. These specifications were established to permit the transporting of the tower over longer distances than are feasible for helicopter flights,

'Mole' Runs Underground Trench

Baltimore Gas & Electric Co is experimenting with a device which punches a 3½-in.-dia hole through the ground at the rate of 1 ft per min. More than 20 successful crossings under streets for installation of street lighting cables have been made during the last few months. On the basis of this limited experience, the "Mole", as it is called, seems to have great potential as a labor-saving device. Furthermore, it promises relief from torn-up lawns, sidewalks and pavements with all related costs and public-relation problems.

The mole, purchased from the Metalexport Co, Warsaw, Poland, is simply an air hammer enclosed in a bullet-like housing to ease its passage through the ground. Its hammer, or piston, sharply strikes an anvil in the front end of the case and thus causes forward motion. The return stroke of the hammer is cushioned by a premature closing of the rear exhaust ports. Friction between the housing and earth is sufficient to prevent any motion of the device to the rear. Internal valving of air flow is arranged so that the hammer reciprocates, providing about 200 blows per min. The unit is about 53 in. long and weighs about 45 lb.

As originally purchased, the device proved unsatisfactory. Jimmy Telmoanowski and Pat Wright of the utility's general shop, and Paul Marshner, of its underground lines department, then took on the job of making it work. Working in slack time, they modified valve springs and installed more effective air seals. With these changes, the mole worked well for several crossings; however, difficulties in aiming it were encountered, and a new simplified sighting technique had to be developed. Other troubles occurred, namely, unreliable starting and intermittent running. Installation of an oiling device and a pressure regulator in the air-supply line corrected these dif-

Increases Line Survey Accuracy

say from a main base to the local camp which may be as much as 2 to 4 hundred miles apart.

The achieved tower-within-a-tower, collapsible and assembled in 10-ft sections with standardized and interchangeable parts, is triangular in shape; can be assembled up to 60 ft. depending on the height of the surrounding obstructions. In the heavy bush areas in northern Ontario this is a great advantage because it permits the laying down of control without the necessity of cutting miles of bush, an expensive item in surveying.

The length of tower needed is assembled at camp and slung underneath a Bell G2A helicopter for transport to the site.

Quick fasteners are used to join the sections. A base-plate for supporting the tower is adjustable for variations in slope or elevation of the ground.

The surveyors' platform, around the outside of the outer tower, permits eye level operation of the optical instruments.

The instrument platform, supported over the inner tower, is adjustable to the eye height of any individual.

To date, the tower assembly has been used to support precise optical measuring theodolites used to obtain vertical and horizontal angles for azimuth, horizontal distances and elevations. The master and remote instruments of electronic equipment can also be mounted for the purpose of taking slope measurements between tower sites. These slope measurements are reduced to horizontal distances and are also used with vertical angles to compute elevations.

Other equipment used on the tower are an optical plumb, targets for angular work and so on.

The length of shots taken vary with the control set out to govern the direction of the route and may extend up to eight miles.

PLATFORM at top of tower is capable of carrying one to two men plus surveying equipment. Vibration-free inner tower is for supporting optical instruments. Entire tower is mounted on base-plates which are adjustable for variations in the slope or elevation of the ground

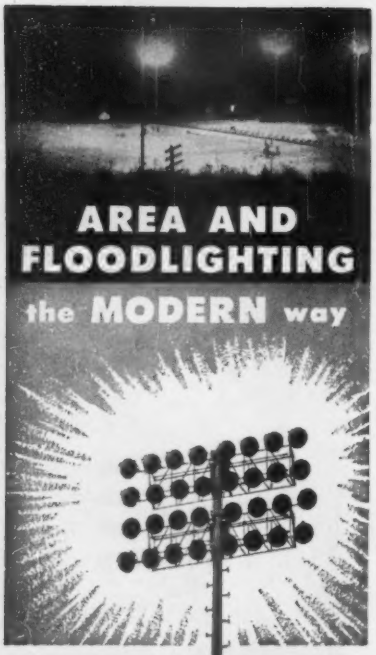
ficulties. With these difficulties resolved, the mole has tunneled successfully through clay, rock at average rate of about 1 ft per min.

If the mole continue to perform as it has recently, a substantial lowering of the cost of getting cables under and across streets might be realized. A firm appraisal of its value, however, cannot be made until it has been in use for a longer period.

(More Construction on page 72)

CIRCLE 30 ON READER SERVICE CARD

'MOLE' completes job of burrowing a distance of 38 ft, at a depth of 3 ft, under the street surface in less than 40 min. Though machine has driven successfully through clay, rock, etc., further evaluation tests are planned



AREA AND FLOODLIGHTING
the MODERN way

TULITO

TAPERED STEEL LIGHTING TUBES

For
- Baseball Diamonds
- Football Fields
- Playgrounds
- Shopping Centers
- Truck Terminals
- Railroad Yards
- Race Tracks
- Radio and TV Towers
- Transmission Power Lines

Engineered for Permanence, Strength and Safety...
Designed to accommodate from 2 to 40 lights.
Streamlined to enhance the appearance of any lighted area.

MEYER MACHINE, INC.
RED WING, MINNESOTA

Anchored Spinner Speeds Spinning

The Gresham Division line department of Portland General Electric Co recently strung 4,600 ft of spun secondary conductors in about 3 hr, by securing the spinning machine in one spot and pulling the messenger line and four conductors through it.

Harold Bither, Gresham line department foreman, developed the idea. Wes Cunningham, Gresham division general line foreman, estimated the same job with the same crew would have taken three days by the old method of drawing the spinning machine along the spans between poles.

The job was undertaken on a section where a road widening project had necessitated a new line. The bundle to be spun included beside the messenger, two hot legs, the neutral and a neoprene insulated street light control wire. The reels of wire were mounted on a trailer so they would pay out properly. The conductors were secured with the messenger to a pulling line with a swivel. Only the messenger was

SPINNING MACHINE is tied with manila line about 4 ft from the pole

G&W CABLE NIGHTCAPS

Seal Unfinished Cable Joints Against Moisture And Dirt

Cable splicing no longer need be one continuous operation when G&W Cable Nightcaps are used. Unfinished cable joints or terminations can be left overnight or for several days at a time with complete assurance that work will remain dry and clean as when sealed.

The G&W Cable Nightcap consists of a heavy plastic sleeve, waterproof paper to keep the plastic clean, tape, desiccant, and humidity indicator. The sleeve is slipped over the unfinished joint and one end taped tightly to the cable. Desiccant and humidity indicator are then inserted into the sleeve and its remaining end taped to the cable on other side of the joint. Waterproof paper is laid over the sleeve for protection.

Further information on the Cable Nightcap is available from G&W Electric Specialty Company or consult your local G&W representative.

G&W ELECTRIC SPECIALTY COMPANY
3500 WEST 127th STREET • BLUE ISLAND, ILLINOIS
CANADIAN MFR. • POWERLITE DEVICES, LTD.
TORONTO, MONTREAL & VANCOUVER

Superior quality standards—inspired specialized design J61-1

CRESCENT HOT LINE GRIPS

FOR SAFE, REMOTE OPERATION WITH HOT LINE STICKS

▶ These grips are an adaptation of the standard Crescent Grip which has earned a reputation with line crews everywhere for being jamproof, slip-proof and instantly releasing.

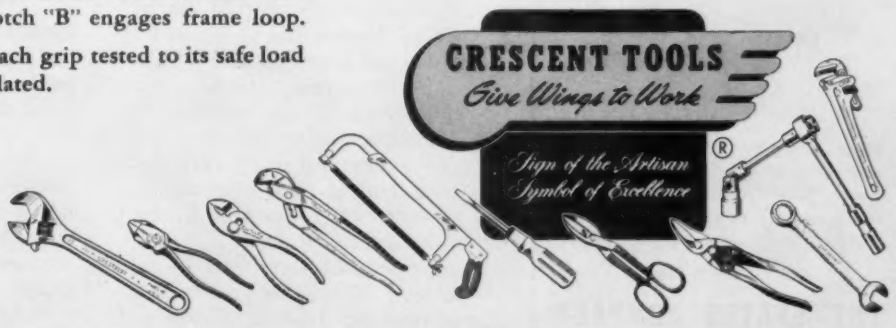
Operation is simple for linemen familiar with the use of hot line sticks. Grip is held open by engaging notch "B" in bottom of frame loop. Grip is then placed on wire by means of eye "A". Latch "C" is swung into place with hot line stick. Jaws are closed when engagement of notch "B" is tripped by upward movement of the pulling eye arm. Grip is released by placing hot line hook on rivet stud "D" and pulling until notch "B" engages frame loop.

Made in three sizes; each grip tested to its safe load capacity. Cadmium plated.

SPECIFICATIONS

SERRATED JAWS	MAXIMUM CAPACITY	MINIMUM CAPACITY
No. 383 HL	5/16 (.3125)" 8 mm	5/32 (.156)" 4 mm
No. 384 HL	1/2 (.500)" 12.2 mm	1/4 (.250)" 6.5 mm
No. 385 HL	3/4 (.750)" 19 mm	3/8 (.375)" 9.5 mm

No. 383-2 HL, 384-2 HL and 385-2 HL same, except with smooth jaws for bare aluminum wire.



Crescent is our trade-mark, registered in the United States and abroad, for wrenches and other tools. Sold by leading distributors and retailers everywhere and made only by

CRESCENT TOOL COMPANY, JAMESTOWN, NEW YORK

STATES TESTING EQUIPMENT

FOR TESTING

RELAYS

RELAY TEST LOAD KIT

CAT. NO. 33559-R

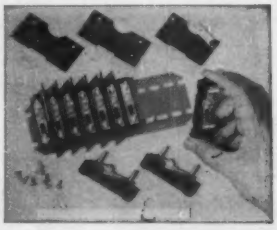
Compact Kit includes Load, Cycle Counter, Rheostat and Control Switches. Smooth current adjustment from .05 to 58 amperes.

TYPE "WR"

In single and double primary and in 30, 50 and 60 ampere capacities.

Sliding Link
NT TERMINAL BLOCKS

States exclusive sliding link feature permits checking electrical circuits at any time without disturbing permanent wiring to and from the block. Just attach test instrument, slide link out of contact, take reading—slide link back in place and bolt—that's all.



Above shows how individual units are mounted on metal strips cut from 65 poles lengths. Thus "NT" Blocks may be obtained complete, or as parts to be assembled to fit any given installation.

Write For Full Details

THE STATES COMPANY

3 New Park Ave., Hartford, Conn.

ANCHORED SPINNER bundles, lashes conductors as they are pulled

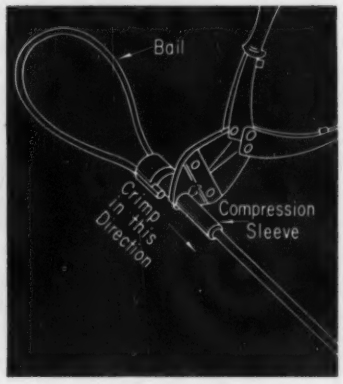
pulled under tension.

The spinning machine, mounted backwards to its normal position, was then positioned around the messenger and the conductors facing the first pole. The spinning machine was tied about four feet from the pole. The messenger was pulled through the spinner, the rest of the conductors pulled along.

The spinner works as it normally would, bundling and lashing the conductors to the messenger with the spinning wire, the difference being that the spinner is stationary and the conductors travel.

Pre-fab 'Deadend' Saves Time

J. E. HEALEY, Supervising Engineer, T & D Standards, T & D Development Dept, Union Electric Co, 315 N Twelfth Blvd, St. Louis 66, Mo.



A pre-assembled compression deadend with an insulated flexible bail saves about one-third the installation time of methods formerly used for deadending some sizes of primary and secondary conductors on insulated clevises. The pre-assembled deadends also are neat-looking and are easy to cover with rubber protective equipment. Design of the deadend was worked out by Union Electric Co, with the assistance of James R. Kearney Co.

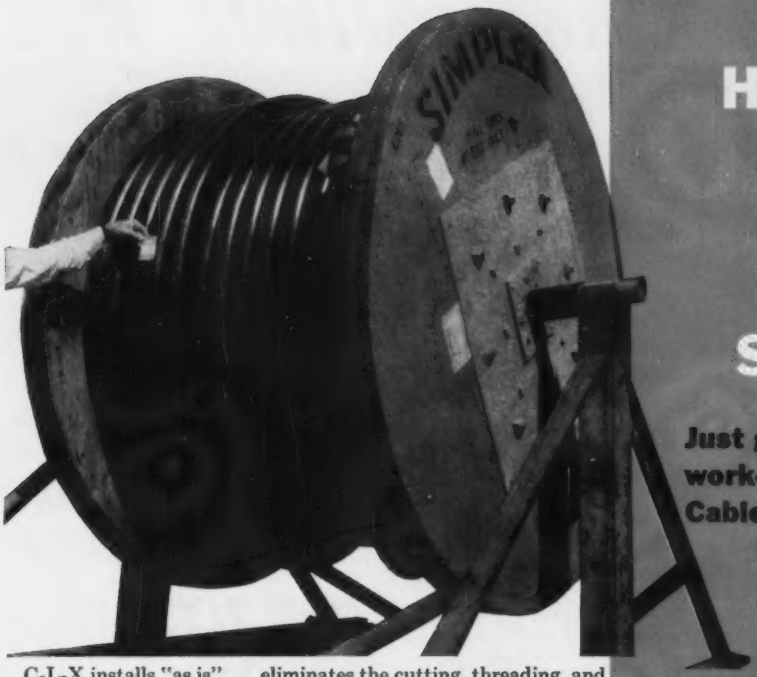
The deadend consists of a compression sleeve attached to a stainless steel flexible bail. The bail is designed to fit over primary and secondary clevis insulators. After assembly by the manufacturer, the bail is dipped in a plastisol compound to insulate it. This eliminates the need to tape the deadend during installation. A different color compound is used for each size of deadend as an easily identifiable means of recognizing the size of conductor for the deadend.

To make a deadend, the lineman places the flexible bail around the porcelain insulator, pushes the conductor into the sleeve and crimps it with a compression tool. The deadends are used on Nos. 6, 4 and 2 solid copper and Nos. 4 and 2 and 1/0 ACSR.

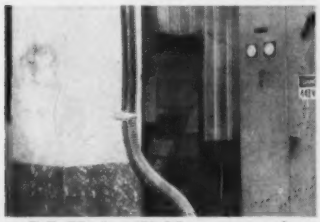
CIRCLE 26 ON READER SERVICE CARD

HOW MUCH MONEY COULD C-L-X SAVE YOU?

Just glance at these time-and-work-saving features of C-L-X Cable Systems by SIMPLEX.



C-L-X installs "as is" . . . eliminates the cutting, threading, and pulling operations necessary with conventional duct or conduit.

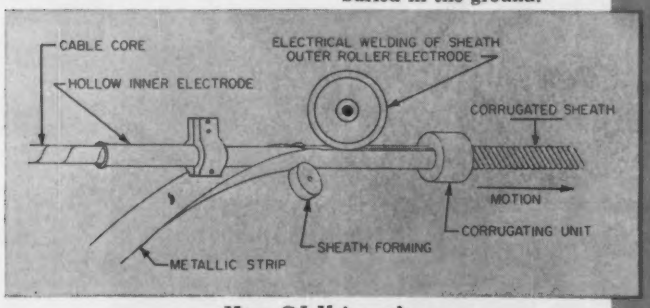


C-L-X is pliable . . . can be handled smoothly on a standard size reel.

C-L-X is easily trained anywhere, in continuous, long-length runs.

C-L-X installs without the need for benders, sand, elbows, or similar fittings.

C-L-X is versatile. It can be installed with clamps, in trays or ladders, or directly buried in the ground.



How C-L-X is made.

You'll see how easily this packaged *combination* of cable and pliable, impervious metallic sheath installs. You'll see why it cuts installation cost to a fraction of that required for conventional cable and duct. Then *find out* how much money today's easiest-to-install cable system can save you.

C-L-X is available with plastic-jacketed sheaths of steel and with sheaths of aluminum, bronze, or copper — with or without plastic jacket. It's the choice of chemical plants, oil refineries, paper mills, utilities, industrial plants — wherever severe environmental conditions exist. Write today for your free, illustrated brochure on C-L-X.

Simplex
WIRE & CABLE CO.
Cambridge, Massachusetts • Newington, N.H.

CIRCLE 75 ON READER SERVICE CARD

DON'T LET "LINEMAN FATIGUE" ROB

Here's how the Kearney Power-operated Tool works

After correctly positioning the Kearney Power-operated Tool on the connector, the lineman squeezes a small rubber bulb conveniently attached to his belt. Air pressure from the bulb closes a switch to start a small motor-driven hydraulic pump on the ground. High-dielectric hydraulic fluid flows through a non-conducting pressure hose, advancing the ram and closing the dies to make the indent. To retract the dies, the lineman simply releases his finger pressure on the bulb.

An optional hand switch control is also available which permits an operator on the ground to control the pump on signal from the lineman making the installation.

YOU OF VALUABLE MAN-HOURS!

Kearney Power-operated Tools take the "muscle" out of compression installations, increase work output, reduce labor costs . . . and often pay for themselves in a month or less!

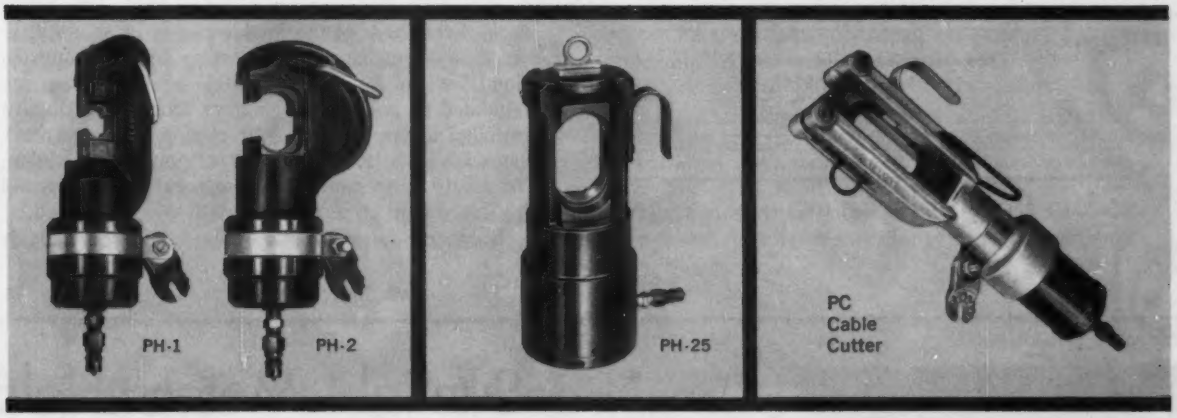
Kearney Power-operated Hydraulic Compression Tools make fast, light work of any compression fitting installation . . . *hot* or *cold*. By simplifying installation and reducing lineman fatigue, Kearney Power-operated Tools enable power companies to effect sizeable reductions in compression connector installation costs.

In use, the lineman merely positions the Kearney Tool on the connector and squeezes a small rubber bulb to actuate a portable motor-driven hydraulic pump on the ground below. The Kearney Power-operated Tool does the rest, without further lineman effort other than to reposition the tool for the next indent. Complete compression of the fitting can be made in less than 30% of the time ordinarily required by a lineman using the most efficient hand-operated tool.

Kearney PH-1 and PH-2 Power-operated Compression Tool Heads and the Power-operated Cable Cutter can be hotstick-mounted to make installations on energized conductor . . . or they can be hand-held for cold work. Using Kearney hotstick-mounted Power-operated Tools, linemen can install connectors, deadends, or sleeves . . . and cut ACSR or standard conductor up to 1½" in diameter . . . at *any* angle . . . with greater speed . . . at greater distances from the pole . . . and with greater safety when working on energized lines . . . than has ever before been possible with hand-operated tools.

An investment in Kearney Power-operated Hydraulic Compression Tools will quickly pay for itself in labor savings and increased work output. A demonstration will convince you.

Three Tool Heads and a Powerful Cutter Head, interchangeable in seconds without tools, offer unlimited versatility



The Kearney PH-1 and PH-2 power-operated indenting heads shown above use the same dies as Kearney WH-1 and WH-2 hand-operated hydraulic tools . . . differ only in their maximum working ranges. For instance, the PH-1 Tool accommodates a range of aluminum Squeezon compression connectors for wire sizes up to a maximum of 4/0 ACSR or strand, while the PH-2 installs Squeezons on conductors as large as 397.5 ACSR or 400 strand. Dies may be easily inserted or removed without tools.

The Kearney PH-25 Tool Head installs a full range of compression fittings, from the smallest Squeezon up to a maximum of 1,192.5 MCM. With this tool a wide variety of fittings can be compressed with half the number of indents normally required using other types of tools. Tool develops 21 tons of thrust. Cutting dies are available for use with the PH-25 to cut conductor up to 1,500 MCM.

The Kearney Power-operated Cable Cutter cuts any type of conductor up to 1½" diameter, in 30 seconds or less. Saves many valuable man-hours otherwise lost in hand-sawing. Produces a clean-edged cut . . . saves deburring. Cutter may be hand-held for cold operation or hotstick-mounted for use on energized lines. Cable cutter and PH-1 or PH-2 Tool Heads can be interchanged in seconds. Cutter can also be used to cut ground rods, guy wires and like materials . . . on the ground . . . or on the pole.

For complete information contact your Kearney Sales Representative

for better construction . . . safer maintenance . . . specify KEARNEY products

KEARNEY

JAMES R. KEARNEY CORPORATION

4224-42 Clayton Avenue • St. Louis 10, Missouri

814

PLANTS AT: ST. LOUIS • MELROSE PARK, ILLINOIS • FAYETTEVILLE, ARKANSAS • GUELPH, ONTARIO, CANADA • ST. THERESE, QUEBEC, CANADA

ELECTRIC UTILITY METHODS

E u m

OPERATIONS & TESTING

Meter Readers Help to Minimize

H. L. DELONEY, Assistant Chief Engineer,
R. M. Ziegler, Engineer, Louisiana Power & Light Co, New Orleans, La.

Voltage complaints have virtually been eliminated on the Louisiana Power & Light Co system through a widespread use of metermen to police the performance of system-wide voltage regulators. The new system of policing the performance of voltage regulating equipment has resulted in improved service to customers and better public relations. Beyond the fact that the operation of the system is exceedingly economical, low cost has been offset by increased revenues resulting from adequate voltage at the time of peak loads. Furthermore, the system provides information from which intelligent decisions pertinent to adding more regulators and capacitors to the system—thus, savings in transformer costs are achieved through elimination of transformer taps and increased load-carrying capacity of system elements, where voltage is the limiting factor.

Voltage regulation is being handled by a combination of TCUL transformers in the substations and pole-type regulators out on the feeders. As a supplement to line-drop compensation on the substation regulators, LP&L has incorporated a "time clock" voltage-scheduling device. The voltage schedule is tied in with the load on a time basis. This takes care of the 70% of the load which is located within the first two or three circuit miles from the substation. Voltage for the other 30% of the load is re-regulated by pole-type regulators which are normally installed at one point on the circuit but in extreme cases are installed at two or three points on a feeder. To assure performance of these regulators an organized regulator inspection program was developed.

Because Louisiana P&L system is widespread such

DISTRICT | C/A NUMBER

LOCATION—STREET OR HIGHWAY NO. AND DISTANCE

REG. NO. | REMARKS

PHASE

COMPENSATOR SETTING

R X R X

R X R X

R X R X

VOLTMETER			REGULATOR				READ	
MIN.	PRES.	MAX.	BUCK	PRES.	BOOST	COUNTER	DATE	BY

VOLTAGE-REGULATOR READING SHEET appears in meter-reading book at regulator location in meter route

LOUISIANA POWER & LIGHT COMPANY
VOLTAGE REGULATOR REPORT

DATE _____ 19__

DISTRICT _____ READ BY _____

REGULATOR NUMBER	PHASE	STREET OR HIGHWAY NO.	LOCATION	VOLTMETER			REGULATOR		

VOLTAGE-REGULATOR REPORT is filled out in duplicate from reading sheet for division eng'r and district files

Sunlight Meters Help

J. W. YOUNG, System Load Dispatcher, Iowa Electric Light & Power Co, Cedar Rapids, Iowa

Sunlight illuminometers have been installed by Iowa Electric Light & Power Co to help forecast system loads and to tell moment-by-moment the percentage of sunlight across the system. These illuminometers, designed by Bill Godsell, power and substation electrician, at the request of the author, cost about $35 excluding installation.

One meter is installed at the system control center in Cedar Rapids and another at the Boone generating plant, about 120 miles to the west. These meters are indicating microammeters with a power source from six solar batteries. They are calibrated to read in percent of sunlight, with full deflection of the microammeter being equal to 100% of maximum sunlight. The meters are read each hour in even percentages and in multiples of ten. This information along, with other

SUNLIGHT METERS are set at control center, 120 miles from plant

Voltage Complaints

an inspection system could be costly in terms of man-hours and travel mileage. To solve this problem, equipment was installed on the regulators which permits meter readers to record regulator information on special sheets in their meter books, at the time they make their meter-reading rounds—the engineers need this information to tell them whether the regulator is performing satisfactorily or needs some attention.

To permit meter readers to get the necessary information, each pole-type regulator installation was equipped with position indicator with reset mechanisms, a veedor counter which records tape-changer operations, and a voltmeter which shows maximum, minimum and present voltage—each of which can be read or operated from the ground. In addition, each regulator installation included a potential transformer with the same ratio as the distribution transformer, plus a "bonus" rating of 165% of the regulator nameplate.

The voltage information is provided by a type V45-"Minimax" thermal indicating voltmeter developed by Sangamo Electric Co. It indicates maximum, minimum and present voltage values by means of three separate pointers. Pointer hands are reset manually by operation of a lever which protrudes through the voltmeter cover.

The regulator control cabinet incorporates the electrically-operated veedor counter and the position reset push-button switch. It is mounted, along with the voltmeter, at a point on the pole accessible from the ground.

On his regular rounds the meter reader records: maximum voltage for the period; minimum voltage for the period; present voltage; maximum tap position during the period; minimum tap position during the period, present tap position and veedor-counter reading. He also makes comments based on a visual inspection. After recording the information, the meter reader resets the position indicator and voltmeter hands so that operating information for the following month will be accumulated.

Division distribution engineers and district managers are given copies of the meter readers' regulator inspection reports for their respective areas. The distribution engineer can tell from his own experience and records whether the regulator has performed properly and to some degree the adequacy of compensation adjustments and circuit loading.

RE-REGULATION with pole-type regulators helps maintain good voltage. Meter reader records information on regulator performance as he makes rounds

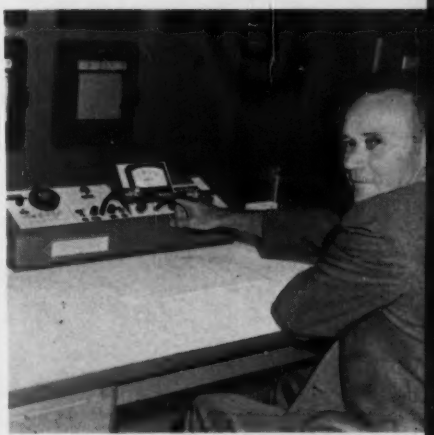
Dispatcher Forecast Load

variable weather data, are put into machine data-processing cards for use in load forecasting.

Each solar battery is a self-generating, selenium photocell and sun battery. This battery has a spectral response similar to that of the human eye. The illuminometer is cosine-corrected only in the manner in which the six batteries are positioned. Three are placed in a vertical manner with the surfaces pointing 120 deg apart. The other three are mounted at a 60-deg angle, with each placed midway between two of the vertical sun batteries.

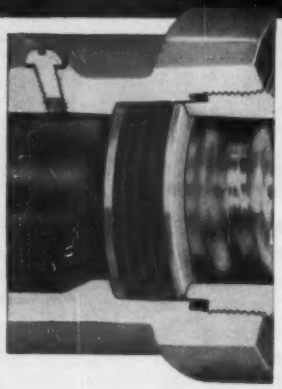
The illuminometer is color-corrected to some degree by the use of a sodium silica glass cover which tends to depress ultraviolet response. This is a standard watthour meter cover placed over a standard socket.

The microammeter is an indicating instrument with a 500-μamp movement. The meter is shunted across all six batteries, with a variable shunt resistor for calibration.



HOURLY READING are punched into cards for machine processing

Resistoyl®
seals moisture out - compound in - on G&W Series 800 Interlocked Armor Cable Fittings!



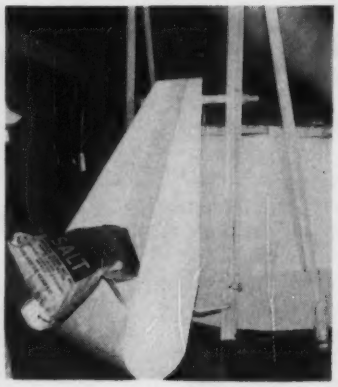
G&W developed Resistoyl®, proven on potheads, boxes, and switches, is highly resistant to oil and water, high temperatures, aging, and compression setting.

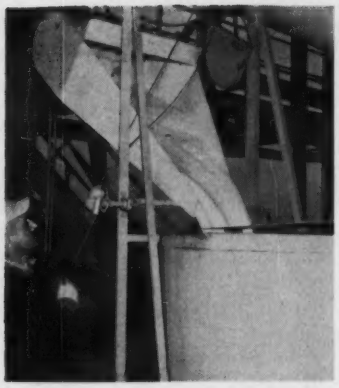
Improved Resistoyl J seals G&W Series 800 Interlocked Armor Cable Fittings on both cable and junction-box ends. Resistoyl gaskets, compressed between two metal washers, press against cable fitting and cable jacket to make a pressure-tight, oil-proof, and moisture-proof seal.

G&W Series 800 Fittings terminate, support, ground, mount, and dead end interlocked armor cable on the widest variety of applications. Four basic sizes accommodate all interlocked armor cable now available; eight different styles in each size accommodate the various types of installations. Ask your G&W Representative for the whole story on Series 800 Fittings, or send for free copy of Catalog H.

® Reg. trade mark

G&W ELECTRIC SPECIALTY COMPANY
3500 West 127th Street, Blue Island, Ill.
H60-2





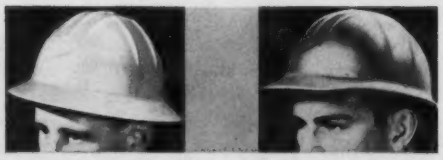
Hoist Adds Salt to Brine Tank

An electric hoist arrangement has been installed at the Michoud Station of New Orleans Public Service, Inc, to make it easier and safer for plant men to add salt to the brine tank. The hoist lowers a "trough" to a convenient height, and a sack of salt is poured into this trough. The hoist then raises the trough, dumping the salt into the brine tank. The arrangement replaces a manual method of adding salt to the brine tank, involving potential strains or ruptures.

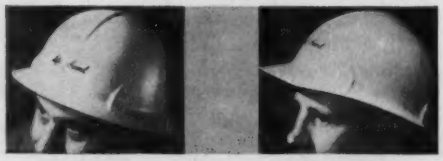
(More Operations on page 82)

6 Jackson Safety Hats & Caps

FIBER GLASS hats (left) and caps are compression molded with polyester resins. They exceed Federal specifications. Eight colors.



ALUMINUM hats and caps are light and strong, pass Federal specifications for impact and penetration resistance. Polyethylene fixed-safety-margin headgears are easy to adjust and clean. Eight colors.



DIELECTRIC plastic hats and caps pass Edison Institute specifications for electrical resistance and Federal specifications for construction workers. Polyethylene headgear. Four colors.

Sold Everywhere by Better Welding Supply and Safety Products Distributors

Jackson Products
5523 Nine Mile Road, Warren, Michigan

CIRCLE 80 ON READER SERVICE CARD
CIRCLE 108 ON READER SERVICE CARD
CIRCLE 81 ON READER SERVICE CARD→

Controlite*

MAKES ALL OTHER LIGHTING CONTROLS OBSOLETE....

and this is why!

Electronic Control Products, skilled and experienced in the design and manufacture of remote signal and control systems, has now developed Controlite, a superior lighting control unit.

- **Only overhead light sensitivity**

The "eye" of the unit admits light only from overhead, at a 10° angle, omitting effects from side light or reflections. No special orientation needed for installation.

- **Hermetically sealed, gas filled, potted plug-in control unit**

Controlite is durable, reliable. It is unaffected by climatic conditions — has built-in thermal control.

- **Unequalled accuracy, for power conservation**

The ambient level of Controlite is regulated to plus or minus 1 foot-candle accuracy. Close control lowers power cost.

- **Models available to replace all other photoelectric control units**

Varied mounting hardware permits mounting on pole tops, arms, luminaires and box enclosures.

The factors of unequalled control, cost savings, ease of installation, make Controlite outstandingly superior.

Write today for complete operating and installation information on this remarkable new unit.

ecp **electronic control products**

U. S. HIGHWAY 22 DUNELLEN, NEW JERSEY

*Trademark of Electronic Control Products.

The Galvanized Steel Strand with the built-in raincoat

Everybody talks about the weather . . . CF&I *does* something about it. To protect Galvanized Steel Strand against corrosion, CF&I builds in a zinc coating that shrugs off moisture. The result is a long-lasting, weather-resistant steel strand that is ideal for overhead ground wire and meets ASTM specification A-363.

Also highly suitable for guying assignments, CF&I Galvanized Steel Strand is made in seven- or three-wire constructions . . . in accordance with ASTM specification A-122. In addition, it can be tailor made to meet your particular specifications.

Like all CF&I products, Galvanized Steel Strand is made by a nationwide company to meet high American standards. For immediate delivery, contact your nearby CF&I warehouse or your local electrical distributor.

THE COLORADO FUEL AND IRON CORPORATION
Denver • Oakland • New York
Sales offices in All Key Cities

'Slides' Increase Effectiveness of Plant Tours

B. L. NORCROSS, J. P. HAYNIE, Results Dept, Atlantic City Generating Station, Atlantic City Electric Co, Atlantic City, N. J.

A series of 35-mm slides have greatly increased the effectiveness of generating station tours at Atlantic City Electric Co's Missouri Avenue Station. Furthermore, use of this series is not limited to visitors, but may be utilized also in employee orientation programs to familiarize new personnel with the company's operations. Additional specialized slides have been made to enable technical personnel to go into the finer details of the system.

Plant noises, the inaccessibility to equipment, safety procedures and the necessity for walking long distances in order to follow the consecutive steps in the generation process have heretofore been limiting factors in gaining the most from this type of tour.

Under the new system, the visitors are taken to the plant's conference room, where they receive souvenirs of their trip in the form of Reddy Kilowatt items and other material. They are then briefed by the plant superintendent with a short, prepared talk on the history of the company and its role in the development of the area.

Using an automatic projector, the slides are then shown with the operator also acting as narrator. Entitled, "Behind The Switch," the pictures, 61 in all, start with a view of a hand about to operate a light switch; then launch into a few views of the plant property, and finally through the actual steps of each process.

In order to make the over-all program readily assimilable, the slides are broken down into coal, water-to-steam, cooling water and generation cycles, using pictures of equipment actually in operation at the station. Thus, the visitors have a chance to become familiar with the equipment and

(Continued on page 84)

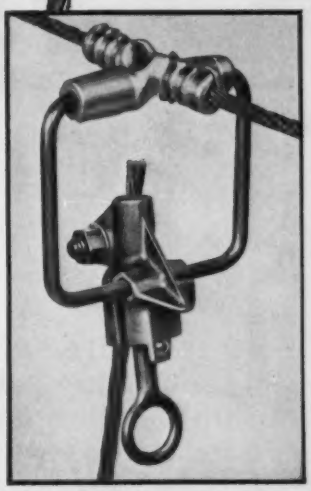
When Hot Line Taps Are Subject to Change

Protect Conductor with Chance Tap and Bail Clamp Combinations

Where jumpers or apparatus hot line taps are temporary or subject to change, these Tap and Bail Clamp Combinations are being widely used to avoid main line "punishment." Chance Snap-on Bolted Bail Clamps or Right Angle Compression Bails permanently installed on the main conductor permit one or two clamp connections to be made on the bail wire. Any arcing that occurs when the tap is connected or disconnected is confined to the bail.

Snap-on spring action and contact guides facilitate installation of the Bolted Clamp. The right angle of the Chance Compression Bail aids installation with compression tools and gives easy accessibility from the pole for tap installation.

To make extra certain that you get a good connection, the contact grooves on all Chance Bail Clamps are filled with z.l.n. 100 Electrical Contact Aid. Bails are available in either aluminum or cadmium-plated copper.



A. B. CHANCE CO.
CENTRALIA, MISSOURI
(A. B. Chance Company of Canada, Ltd., Toronto)

There's a Chance Tap Clamp for Every Conductor Material . . . Every Conductor Size

To complete the job and get the best possible connection, select tap clamps that have been specifically engineered for their purpose. You always get that "specific engineering" when you select from the Hot Line Clamp pages in your Chance catalog. And you can see the specific test data that proves this point. There you will find 18 different sizes and current ratings of protected thread clamps — for every type and size of main line conductor up through 397.5 MCM ACSR and the right size jumper terminal to meet the need.

PACKAGED FOR BETTER CONNECTIONS

All Chance Hot Line Clamps are available individually packaged with z.l.n. 100 Contact Aid factory-applied to the contact area. Sealing tapes on the package remind linemen to clean and coat the conductor. Standardize on Chance Individually Packaged Clamps, and get better connections — automatically.

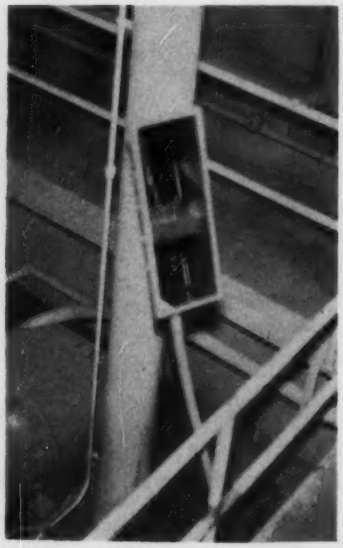
CC81-24

its function before they see it. To relate the generation process to the consumer, the slides follow the transmission and distribution system from plant to home.

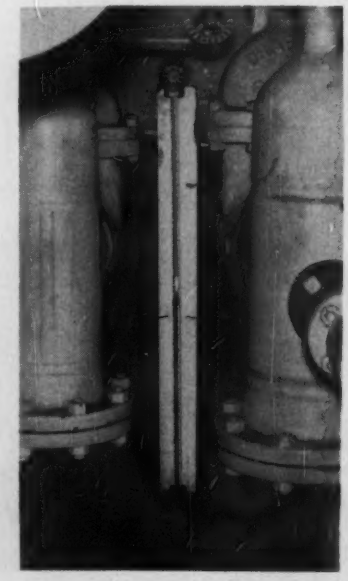
The package is then tied up with a short verbal summary of the operation and ends with a showing of the opening slide, a hand operating the switch.

Following a question-and-answer period, the visitors are taken in small groups through the station, where they can more easily follow the relationship of the various operations. They may also get a more complete realization of the size and complexity of the equipment used.

Reception of this program by visitors has been very warm, and has led, the authors feel, to a more thorough understanding of their business.



Mirror Helps Operator See Gage



A mirror, installed between manually-operated condensate bypass valve and water-level gage, guides operator and thereby eliminates the possibility of faulty condensate regulation.

When the automatic condensate regulator in the No. 4 hotwell at Paterson Station of New Orleans Public Service, Inc, is out of service, condensate is regulated manually by use of a by-pass valve. However, the water-level gage originally could not be seen from the by-pass valve location because it is on an upper level, behind the operator at the valve.

To correct this condition, a mirror was installed. Now, the man operating the valve can see the level of the water in the mirror as he operates the valve.

Call Graybar for Coffing Safety Pull roller chain hoists For safe, efficient lifting—specify Coffing Roller Chain Hoists. Available in 14 models, with capacities from 3/4 to 15 tons, they can be operated from either side, and will work sideways, inverted or upright. Dual ratchet and pawl construction insures that at least one pawl is always engaged, so the load is always under positive control. Safety handle will bend before any load-bearing part can fail. Get details on these and other Coffing Hoists from Graybar. It's another reason to call Graybar—for everything. Graybar Electric Co., Inc.: local service to utilities through coast-to-coast warehousing. GraybaR

633

ANY MAN CAN WEED-PROOF 10,000 SQUARE FEET IN TEN MINUTES...with UREABOR®31

Get lasting protection from weeds and grasses this easy low-cost way

A SPECIAL SPREADER simplifies and speeds the UREABOR 31 applications at low rates with accuracy. Spreader holds enough UREABOR 31 to treat 1250 sq. ft. without refilling; weighs a mere 6 lbs. Width of the swath can be adjusted.

STANDARD PACKAGE IS 50 LBS. UREABOR 31 is packed in multiwall paper sacks for easy handling—easy storing. A convenient package, easily disposable, for spotting at predetermined intervals to facilitate large-area applications.

UREABOR 31 IS 3 HERBICIDES IN 1 The plant-destroying powers of 3 proven herbicides are combined in this granular mixture of sodium borates, substituted urea, and trichlorobenzoic acid to yield fast, long-lasting, nonselective results.

UREABOR 31 is a special weed killer for industrial grounds. It lowers maintenance costs... protects property... and improves appearance. UREABOR 31 is effective on a greater variety of weeds and grasses than any other herbicide now on the market. A single dry application gives year-long control! Yet it takes only 1 to 2-lbs. per 100 sq. ft. to do the job! As a granular material, UREABOR 31 is always ready to use... and safe to handle. It's a big time saver too... any man can easily weed-proof ground at the rate of 1,000 square feet per minute.

Write for literature now!

U.S. BORAX

630 SHATTO PLACE, LOS ANGELES 5, CALIFORNIA
3456 PETERSON AVENUE, CHICAGO 45, ILLINOIS
4028 CORONADO PLACE, OKLAHOMA CITY, OKLAHOMA

Switch & protect residential underground circuits . . . in air

S&C's new pad mounted gear employs fuses and disconnects expressly designed for compact air-filled enclosures

The simplicity and practicality of overhead distribution practices are now available on residential underground circuits. "Air-filled" S&C pad mounted gear switches, protects and isolates pad mounted transformers and buried cables. It provides all these advantages, too:

1. Full load switching and fault interruption are *outside the transformer.* No arcs are drawn under oil to cause fires, "burping," contamination. External switching also means *visible air gaps.*

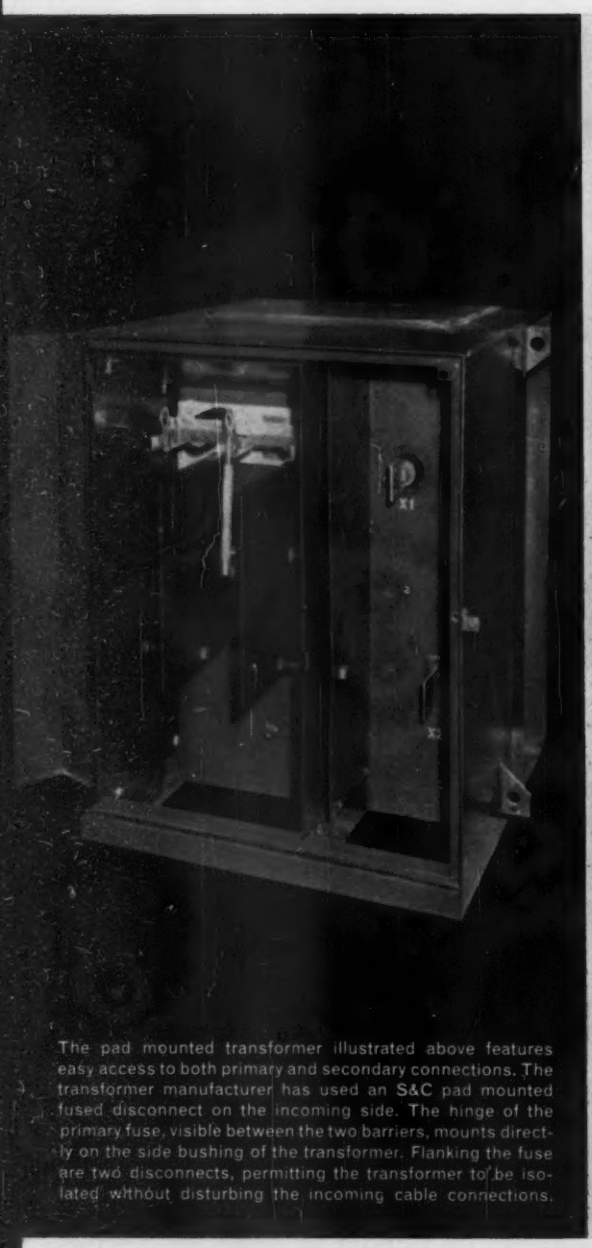
2. Fuse eliminates need for primary link inside transformer. Transformers needn't be untanked for re-fusing.

3. Wide choice of fuse ratings (up to 200E amperes continuous) permits close coordination, anticipates load growth.

4. Both transformers and cables can be switched. This applies to load currents, charging currents, and magnetizing currents.

5. Eliminates the hybrid combination of overhead sectionalizing with pad mounted transformers—puts your residential distribution system entirely underground.

You can order S&C pad mounted gear in almost any disconnect and fuse arrangement for sectionalizing . . . or components for transformer primary applications.



The pad mounted transformer illustrated above features easy access to both primary and secondary connections. The transformer manufacturer has used an S&C pad mounted fused disconnect on the incoming side. The hinge of the primary fuse, visible between the two barriers, mounts directly on the side bushing of the transformer. Flanking the fuse are two disconnects, permitting the transformer to be isolated without disturbing the incoming cable connections.

The fused disconnect above is S&C's Standard Duty Style; the disconnects are rated 200 amperes continuous (8,000 amperes momentary); the fuse is rated up to 50 amperes continuous, 8,000 amperes interrupting. With Loadbuster, the disconnects and the fuse can switch full load.

S&C ELECTRIC COMPANY

4421 Ravenswood Avenue • Chicago 40, Illinois

Specialists in High Voltage Circuit Interruption since 1911

S&C Heavy Duty Pad Mounted Fused Switching Unit shown above is a complete, free-standing device—functioning, in this case, as loop tap serving adjacent pad mounted transformer. Disconnects are rated 600 amperes continuous (25,000 amperes momentary). Power fuse is rated up to 200 amperes continuous, and 17,500 amperes interrupting.

Note how visible circuitry reduces chance of operator error. With Loadbuster, S&C's portable loadbreak tool, the operator can switch full loads—up to 400 amperes at 14.4 kv.

CIRCLE 87 ON READER SERVICE CARD

LIGHTWEIGHT portable hoist is readily chained to pole to lift transformer

Lift Transformers With Quickly-Rigged Portable Hoist

C. E. MILTENBERGER, Supervising Engineer,
WILLIAM S. WAECKERLE, Engineer, T&D Work Practices, Union Electric Co, St. Louis, Mo.

A portable, 33-lb electric hoist is solving the problem of raising transformers and other equipment on poles on rear-lot lines for Union Electric Co. With a lifting capacity conservatively rated at 500 lb, the hoist can handle several times that weight using a block and tackle. Use of the hoist affords the crewman raising the transformer a maximum of control and safety during the lifting operation.

The lightweight hoist was developed by Parke Thompson Associates of St. Louis, working with the authors.

It consists of a one-piece hoist and bracket which fastens to the pole with a chain. The hoist is controlled through a foot switch. It is powered from a nearby secondary circuit or from a 110-v ac generator on the line truck.

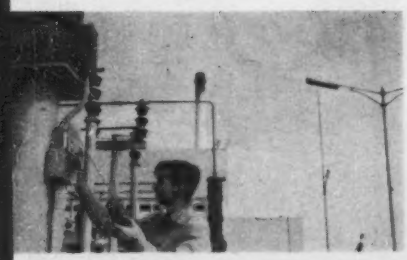
Prior to the development of the hoist, transformers were raised on rear-lot poles using the capstan on a line truck. This method required elaborate rigging in many cases to extend the winch line 200 to 300 ft from the truck to the pole. In some cases the crewman operating the winch line was unable to see the pole on which the transformer was being placed, thus calling for relayed hand signals for starting and stopping. With the portable hoist, the crewman, standing back from the pole, has the transformer in view at all times and can control its movement with maximum safety.

If the early experience of Union Electric is any indication, this electric hoist may prove to be one of the most useful and versatile tools put in the hands of construction forces in the industry in many years. The original idea was to develop a device for hanging transformers in locations with difficult truck access. The hoist has proven ideally suited to that application.

In addition to a variety of uses in overhead construction such as pulling transformers on dollies from the truck to the pole, setting replacement poles and stringing secondary conductors, Union Electric crews expect to find the hoist useful in substation, underground and transmission work.

CIRCLE 27 ON READER SERVICE CARD

Walkie-Talkies Speed Many Jobs



'WALKIE-TALKIE' aids in control circuit checking between plant switchboards and substations at the plant

"Walkie-talkies" are finding broader application on the Florida Power Corp system since new lightweight and compact units have become available. They have stepped up the efficiency of many activities where communications between men are so important — often eliminating the necessity for stringing wires for telephone connections during many jobs.

Florida Power Corp employees are using the new units: during plant construction to guide crane operators while setting heavy equipment in place; to make line-voltage adjustments; for making control circuit checks between plant switchboards and substations in plant yards; for adjustments on microwave antennae.

The units recently purchased by Florida Power Corp are capable of transmitting and receiving over about a mile. Each unit weighs less than 2 lb, including battery, and is about the size of a cigarette carton. Neither a permit nor a license is required for the short-range radios.

Extreme care must be exercised to prevent the unit's telescoping antenna from contacting energized lines or equipment.

(More Maintenance on page 90)

WHY LINEMEN RELY ON KLEIN CLIMBERS

There is no piece of equipment more important to a lineman's safety than his climber. Klein pioneered in the development of the climber back when the first wires were strung, and today Klein climbers are preferred because of their safety design, built-in comfort and wide range of styles to suit every preference.

Whether it is a replaceable gaff, adjustable climber or fixed length climber . . . with riveted ankle loop or triangular ring . . . you will find it listed in the Klein Catalog. For convenience, all adjustable climbers may be obtained complete with straps and pads.

Klein adjustable climbers may be had with replaceable gaff—matched pairs, right and left.
1958-AR with riveted ankle loop.
C-1958-AR as above, complete with straps and pads.
1959-AR with triangular ankle ring.
C-1959-AR as above, complete with straps and pads.

WRITE FOR:

- Bulletin 458, showing manufacturing and testing details.
- Bulletin 154, Proper Sharpening of Climbers.

Fixed length and other patterns of climbers available. See the Klein Catalog.

Adjustable "Pole Master" climbers. Matched pairs, right and left. Fixed gaff.
1945-A with triangular ring at ankle.
C-1945-A complete with straps and pads.
1957-A with riveted ankle loop.
C-1957-A complete with straps and pads.

The famous Klein adjustable climber accepted as standard by many utility companies. Interchangeable right and left.
1901-MA with riveted ankle loop.
C-1901-MA complete with straps and pads.
1956-A with triangular ring at ankle.
C-1956-A complete with straps and pads.

ASK YOUR SUPPLIER

Foreign Distributor: International Standard Electric Corp., New York

Mathias KLEIN & Sons
Established 1857 — Chicago, Ill., U.S.A.
INCORPORATED
7200 McCORMICK ROAD, CHICAGO 45, ILL.

Call Graybar for tough, lasting guaranteed Salisbury protective equipment

Salisbury linemen's rubber protective equipment is guaranteed against any manufacturing defect—and is guaranteed to meet all labeled voltage ratings. New Salisbury Ubangi Stirrup Cover and Dead End Protector, are but two of scores of Salisbury safety devices covering all linemen's requirements from gloves to blankets. For details, get the 40-page Salisbury catalog from Graybar. And always remember to call Graybar—for everything. Graybar Electric Company, Inc.: local service to utilities through coast-to-coast warehousing.

GraybaR

630

CRACKED INSULATED ELLS are eliminated with "humped" elbow jackets

'Humped Elbow' Cuts Costs, Time

New-type elbow jackets, used at the Huntington Beach Plant of Southern California Edison Co, are eliminating costly maintenance, repair and inspection problems stemming from the cracked pipe insulation on ell points. This jacketing substantially reduces material and labor at installation. Furthermore, the jacket design eliminates the eyesore of cracked and shedding insulation.

The weakest point of all pipe insulation is at the ell joint. Sooner or later, cracks invariably appear because of pipe expansion, and, as the insulation deteriorates, the thermal efficiency at this trouble spot is seriously affected. Left long enough in this condition, pipe corrosion sets in.

Wherever pipe ells are insulated, the practice is to cover them with a combination of protectors ranging from cements, mastic weatherproofing, canvas and chicken wire to special paint coatings. Also, the application of the usual weather-proofing materials can involve costly labor time, because proper covering of the ell-joint insulation requires a lapse of time to allow for drying between certain stages of the coating operation. This can extend to a few days and necessitate repeated calls by the work crew before the job is completed.

These costly routines and time delays can be minimized by enclosing the insulated ells with aluminum "humped elbows," designed and manufactured by the General Aluminum Supply Co, Kansas City, Mo.

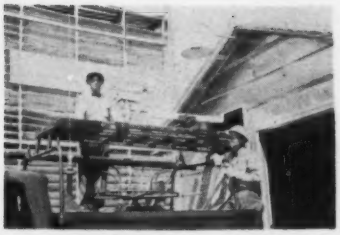
The GASCO elbow jacket has a "hump" located at the vertex of the bend which allows the jacket to be fitted to the OD of the insulated ell. This hump permits the jackets to cover 109 combinations of pipe sizes and insulation thicknesses from a selection of only 13 manufactured sizes. Hence, with a limited supply of humped elbows, power plants can immediately handle their normal needs without stocking a hugh inventory covering all 109 sizes. The 13 sizes of the two-piece humped-elbow covers fit any ell from 3-in. OD through 12.81-in. OD, either long or short-radius ells. These neat preformed jackets fit screwed or socket-welded fittings, and may be attached by metal bands, screws or POP rivits—no fussing or cutting away of the insulating material is required to make them fit the ell.

The humped elbows can be installed inmmediately after the insulation has been applied, in no more than 5 to 10 min. In fact, the jackets can be used as forms for the insulation.

Inspection and maintenance is vastly simplified, since it takes only a few minutes to detach and then reapply the jackets—with no repeating of the masking, chicken wire and paint-covering job all over again. The aluminum covering, of course, withstands weathering in a manner that cannot be matched by many other protectors.

The humped-elbow cover has good overlap onto the adjacent pipe insulation—important when used over preformed insulation ells or, for that matter, when used over field-built ell insulation.

CIRCLE 28 ON READER SERVICE CARD



EXTENSION LADDER is easily moved to or from truck on rack

Storage Rack Safely Transfers Ladder

TRAVIS THOMAS and **RICHARD DUDLEY**, Journeyman Linemen, Line Dept, Southern Div, Southwestern Public Service Co, Post, Tex.

Convenient and safe indoor storage of a removable extension ladder is provided by a special overhead rack built into a small warehouse used by Southwestern Public Service Co. The rack allows the ladder, used in relamping street lights, to be transferred safely and directly to and from the carrier on the service truck.

Designed and built by the authors, the rack consists of an inverted T-beam rail suspended from the ceiling of the warehouse. The rail extends outside the warehouse for several feet. Riding on the rail are two assemblies which hold the extension ladder at both ends. Each assembly consists of a steel channel frame, two wheels and a steel pipe with a hinged hook at either end. Shanks of the hooks on the assembly that holds the foot of the ladder are longer than the others to accommodate the greater width of the ladder.

To load and unload the ladder, it is necessary only to back the truck to the building, open the bottom-hinged door, and move the ladder along the rail directly in or out of the building.

LIGHTWEIGHT
All Aluminum-Magnesium Alloy
Conductor Stringing Blocks

S&R exclusive safety locking head pin. Type GNA Permanently Bonded Full NEOPRENE lining optional. All S&R Blocks have anti-friction ball bearings.

74-A SERIES
Conductor guard comes over sheave rim to guard against pulling line or conductor from fouling between frame and sheave. Particularly valuable for tension stringing.

73-A SERIES
Wide throat for passing compression sleeves. Designed for reconductoring—particularly valuable when the old conductor is used for a pulling line.

New '61 Catalog Sent on Request

Sherman & Reilly, Inc.
ENGINEERS AND MANUFACTURERS
First and Broad Streets
Chattanooga 2, Tennessee
Telephone AMherst 7-1273

Exclusive Canadian Representative:
A. B. Chance Company of Canada Ltd.
Box 10 Toronto 13.

Mail coupon for new catalog
Sherman & Reilly, Inc., 1st and Broad Streets, Chattanooga 2, Tennessee
Please send the new S&R complete catalog of Conductor Stringing Equipment.
NAME
COMPANY
ADDRESS

where you find... TRANSMISSION DISTRIBUTION *you'll find S&R...*

CIRCLE 91 ON READER SERVICE CARD

METALFAB DISTRIBUTION TRANSFORMER TANKS ... *dependably built to your design*

Our long experience and great flexibility of design enables us to meet all specifications . . . TRANSFORMER TANKS produced to your specific requirements — in five diameters from 12 to 21 inches, any height. Our established reputation is your assurance of economy with quality. Designed and built to NEMA standards. Prompt attention given to all inquiries.

METALFAB
INC.
BEAVER DAM,
WISCONSIN

CIRCLE 109 ON READER SERVICE CARD

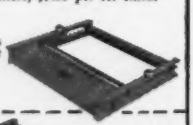
- Easily portable
- No jacks
- Handle any reel diameter
- Heavy steel frame
- Slanted front
- Ball-bearing, adjustable rollers
- Positive roller lock for unloading

Load cable, wire, rope or anything on reels onto Roll-A-Reel for easy, smooth pay-out or take-up.

All are drilled for optional auxiliary ball-bearing side rollers, $5.00 per set extra.

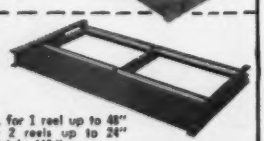
STYLE A

2,000 lbs. cap. for reels up to 28" wide. Weight 80#.
PRICE $46.50
f.o.b. Cincinnati



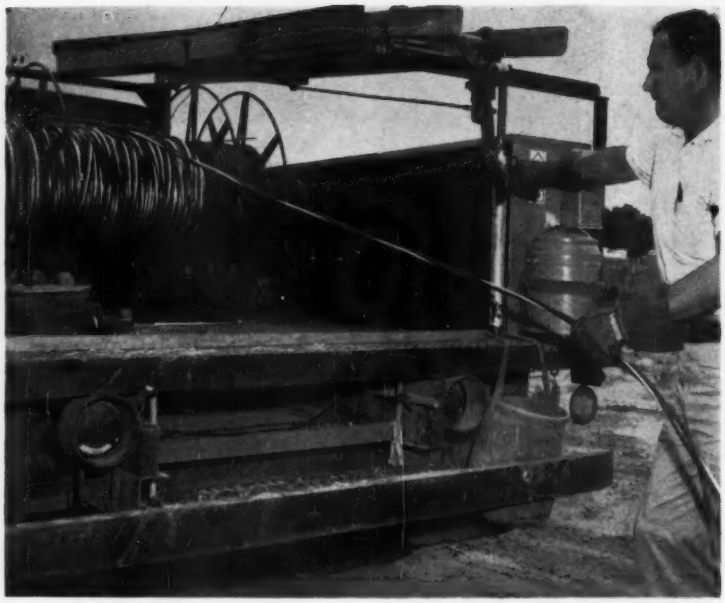
STYLE B

4,000 lbs. cap. for 1 reel up to 48" wide; or for 2 reels up to 24" wide each. Weight 110#.
PRICE $84.50
f.o.b. Cincinnati



• Special sizes on request.

ROLL-A-REEL
4628 Reading Road
Cincinnati 29, Ohio



Powered Reel Saves Wire 'Ends'

JOHN HOLTSCLAW, Oklahoma Gas & Electric Co, Oklahoma City, Okla.

Powered reels on service trucks eliminate the loss of "ends" of service wire and speed the installation of services for Oklahoma Gas & Electric Co. Experience with the "Utility Powereel," made by Northeast Equipment Co, Oklahoma City, has justified the use of the powered reels on four trucks in Oklahoma City and on each service truck operating in the larger towns served by the utility.

The Powereel allows the serviceman to pull out the right amount of up to three different types of service wire from one unit. Excess wire is re-reeled by the unit, saving an estimated 20% of wire formerly lost as wire ends. The unit also saves time previously spent reloading wire on manual reels in the field.

The standard powered unit has two or more dividers mounted on the 36-in.-dia reel's 12-in. hub. In the three spaces OG&E carries 1,000 ft of 1/0 triplex, 1,500 ft of No. 4 triplex, and 2,000 ft of 1/c aluminum weather-proof wire on a reel 57 in. long.

The reel is powered by a 12-v dc motor fed from the truck's electrical system. No troubles have been reported from this method of powering the reel, even when servicemen have spent up to 20 min winding conductor onto the reel. OG&E has found that the serviceman must carefully pull service wire off the reel to avoid over-travel and the paying-out of too much wire. Within the next 2 yr, as older service trucks are replaced, it is expected eight trucks in Oklahoma City and up to 30 over the system will have the powered unit.

CIRCLE 29 ON READER SERVICE CARD

Whether a Winch Line Hook or a complete Line Body check your requirements with

UTILITY TOOL & BODY CO.
CLINTONVILLE, WISCONSIN
UT&BCo

CIRCLE 92 ON READER SERVICE CARD

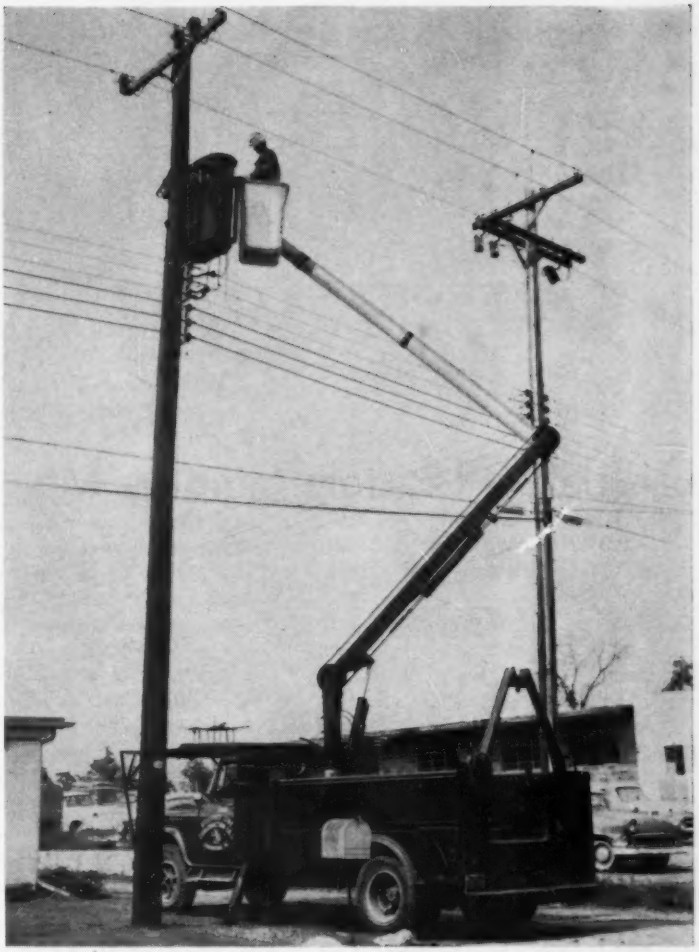
CIRCLE 110 ON READER SERVICE CARD

THESE 4 IMPORTANT "FIRSTS"

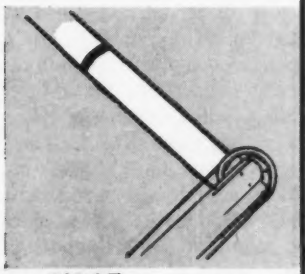
GIVE YOU COMPLETE PROTECTION IN AN AERIAL DEVICE

Four times the Asplundh Chipper Company has been the first to offer improved safety features,—each a vital step toward "complete" protection of the operator and those on the ground.

The Asplundh Line Lift also features the articulating boom, greater maneuverability and lower maintenance. Here's a unit that's quickly positioned, delivering outstanding performance in daily operation.



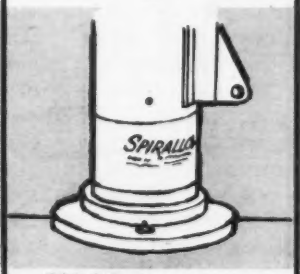
1



FIRST WITH THE ALL FIBERGLASS BOOM

—The spirally-wound glass filament upper boom* of the Asplundh Line Lift will withstand voltages in excess of 50 K.V. **There is no laminating or coating; it is a completely insulated boom.*

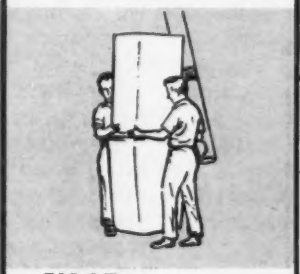
2



FIRST WITH THE PYLON INSERT

—The spirally-wound glass filament pylon insert eliminates the possibility of energizing the truck, assuring persons on the ground of greater safety.

3



FIRST WITH THE INSULATING BASKET LINER

—The Asplundh Line Lift is the *only* aerial device offering insulating basket liners as standard equipment on all units. Liners are immersion tested and certified to withstand 50 K.V. AC for one minute.

4

FIRST WITH DIELECTRIC TESTING OF EVERY UNIT

—The Asplundh Chipper Company is the only manufacturer of aerial devices that subjects each assembled unit to a high voltage acceptance test.

Write today for complete information

ASPLUNDH Chipper Company

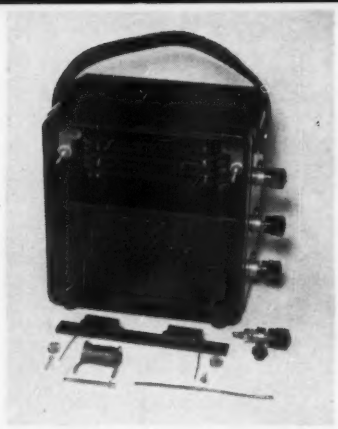
Hamilton St., Chalfont, Pa.

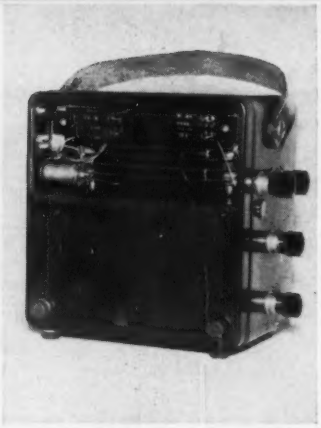
CIRCLE 93 ON READER SERVICE CARD

ELECTRIC UTILITY METHODS

E u m

STORES & SHOPS





OUTDATED VOLTMETERS were economically converted to 600-v service by mounting resistors and spool (setting in front of instrument, left), inside case

Quality Resistors Simplify Meter Conversion

ARLO W. SHAVER, Meter Engineer, Florida Power Corp, St. Petersburg, Fla.

Small, high-quality resistors are permitting quick and economical conversion of more than 200 obsolete voltmeters to solve an acute service problem at Florida Power Corp, St. Petersburg, Fla. By mounting small, high-quality resistors and a resistor spool in the existing resistance space of the voltmeter, it is possible to achieve the required conversion using the original meter case and scale. The range of these instruments is now being increased to 600 v—the resistor spool permits calibration of the voltmeter on the 600-v range. The same scale face is used by printing a multiplier on the instrument with the aid of an instrument-numbering machine.

Voltmeters purchased by FPC on or before 1957 were outdated with the advent of 480-v service. Initial efforts to convert the meters, using standard replacement parts, required about four manhours' time per unit—with material costs running about $47.00.

The material cost per unit, using the high-quality resistors for 50 units, including an additional terminal and identification plug, is about $11.00. Average time for conversion is about 3 hr.

40-Kv Glove Tests Prevent Mishaps

Rubber gloves used by the Niagara Mohawk Power Corp's personnel working on "hot" equipment are undergoing rigorous voltage tests at the company's new Meter & Test Center located in the Syracuse-Buffalo area. Furthermore, Niagara Mohawk has instituted a safe-glove program which insures that *all* rubber gloves for the company's 1,500 linemen and other crew members are puncture-free.

Each lineman and crew member is issued two pairs of special rubber gloves—one pair with a yellow label and the other with a green label. Each crew member uses the same color-label gloves, and every two months the crewmen must turn in one pair for inspection. They then use the second-color gloves.

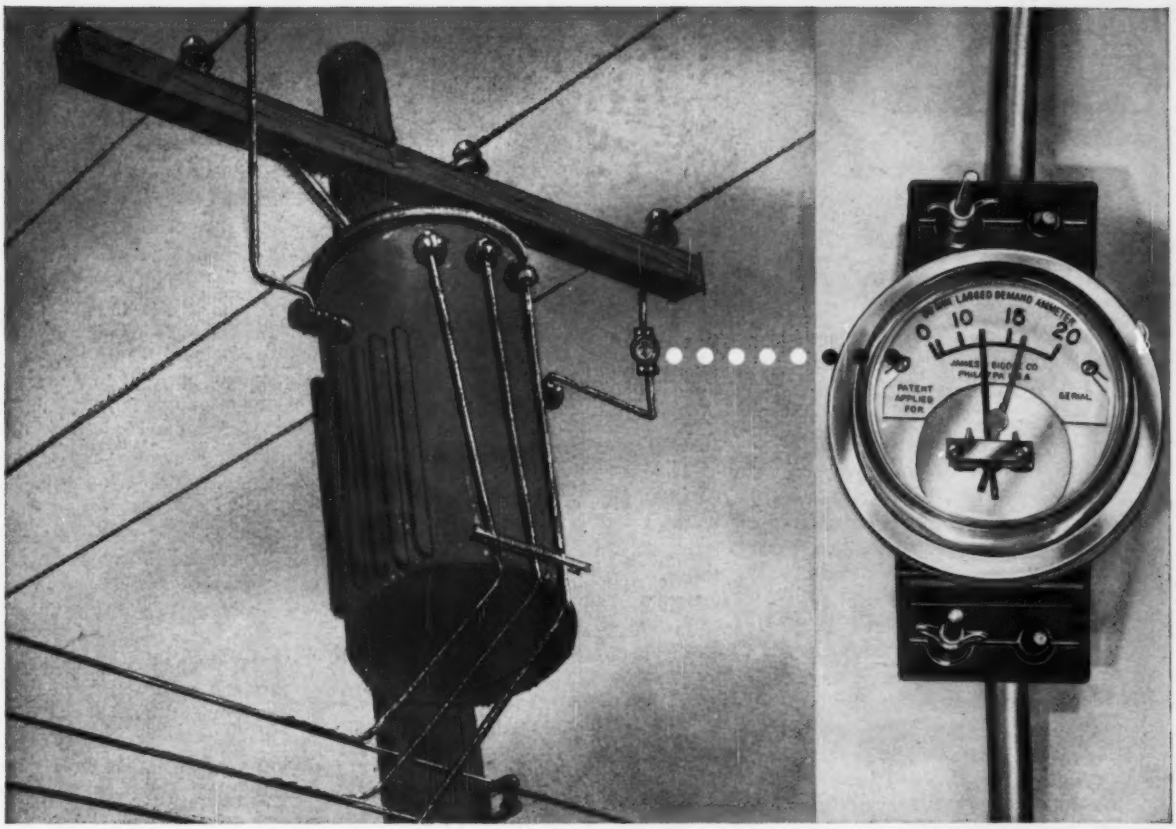
Gloves from Niagara Mohawk's Central and Eastern Divisions are sent to the Meter & Test Center, Clay, N. Y., and those from the Western Division are forwarded to the Buffalo, N.Y., Test Center. They are placed in an automatic washer to free them of dirt or any other foreign matter. After being dried, they are put into an automatic testing machine. Here, 40 kv of direct current are sent through them for 3 min. If a glove has even the most minute defect, it is detected by a light on the testing machine. The glove is discarded if defective.

Those which have passed inspection are dried, boxed and shipped back to the crews, each crew member being given his original set of gloves. Some 18,000 pairs of new and used gloves will go through this process at the new Meter & Test Center this year, and records will be kept of each testing.

In addition to gloves, rubber sleeves and the rubber blankets will be tested at the center.

Explaining that everything possible is done to insure against injuries through defective gloves, Anselmo Fini, superintendent of the Meter & Test Center, observed that "a crew member must have confidence in his equipment."

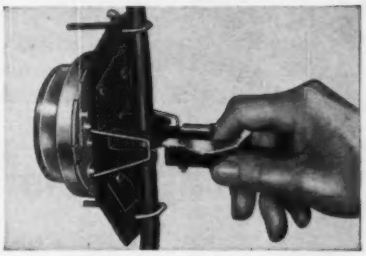
'PINHOLE DETECTIVE' sends 40 kv through set of 'live-line' work gloves



The BIDDLE LOAD INDICATOR

...provides a practical means for determining distribution transformer loading

. . . makes system monitoring economically sound through—low unit cost—minimum installation time and labor—no electrical connections or disconnections—no tools required.



Install Biddle Load Indicators for the life of your distribution transformers—they're rugged and completely conditioned for all weather and climates—and they are reliable in their performance.

The Biddle Load Indicator is, very simply, a demand ammeter with a 30-minute lag for indicating peak load. *It indicates the magnitude of the load,* not just a signal of a predetermined overload.

A red, maximum reset pointer indicates maximum value obtained since previous reset and is reset simply by passing a magnet across the face of the glass scale cover.

The black indicating pointer follows current changes, indicating the preceding 30-minute load continuously.

The Biddle Load Indicator will provide more of the nature and magnitude of actual transformer loads than has been obtainable before except by costly and prohibitively time-consuming methods.

Complete system load-monitoring is possible and economically sound with this simple but reliably accurate instrument.

For complete details write for Bulletin 50W.

B112

BIDDLE INSTRUMENTS

JAMES G. BIDDLE CO.

Electrical and Speed Measuring Instruments / 1316 ARCH ST., PHILADELPHIA 7, PA.

ELECTRIC UTILITY METHODS

SAFETY

WEEKLY SAFETY SHEETS cover a variety of subjects. After reading weekly sheet to crew, foreman encourages thorough discussion of topic covered

Discuss New Safety Topic Weekly

I. R. DOHR, General Safety Supervisor, Consumers Power Co, Jackson, Mich.

The "Foreman's Safety Roundtable," a new program developed by Consumers Power Co, is aimed at strengthening the chain of safety communications at the foreman level. Since the introduction of the program in January, 1961, its acceptance has been very good. The company has found their foremen anxious to receive assistance. By furnishing them with ready-to-use material for on-the-job safety meetings, an effective way of promoting safety at the job level has been established.

The objectives in adopting this program are: **(1)** To aid foremen in having on-the-job safety meetings; **(2)** To help foremen develop the habit of having regular meetings, plus special meetings for difficult jobs; **(3)** To introduce foremen to safety in a positive way; **(4)** To improve foremen-crew relations through group discussions and exchange of ideas; and **(5)** To secure more participation in accident prevention by employees, thus making them more active members.

The company feels that the foreman supervisory level should be the strongest point in the safety lines of communication. Thus, through the Safety Roundtable program, the foremen receive safety topic sheets each week, covering special subjects of interest to them and to their crews. After reading the weekly sheet, each foreman holds a meeting with his men during which the current topic is discussed thoroughly.

The material being used currently by Consumers Power has come from the National Safety Council. However, in the future the program will be expanded by using material exchanged with other companies. Talks also will be built around accidents which occur on system, in addition to subjects submitted by the men themselves.

Training Aerial Basket Crews Is a Must

G. A. NEWSOM, Electric Distribution Operating Engineer, Consumers Power Co, Jackson, Mich.

Mobile aerial basket units definitely provide better service to customers by reducing and/or eliminating normal and emergency interruptions and by cutting the time to give service during construction. This stamp of approval has been placed on aerial baskets for line work, tree trimming and street light maintenance by Consumers Power Co after about 3 yr of experimentation and careful field testing—however, such advantages can be achieved only if the basket crews have been effectively trained in the safe, efficient methods of basket operation.

The following points have been emphasized in the training program for aerial basket crews at Consumers Power Co:

(1) In general, the lead lineman is permanently assigned as one member of the two-man crew for aerial-basket equipment. The other position is rotated to allow all linemen who climb to become familiar with not only the operation of the equipment but also the positioning of the truck to perform a job with a minimum of boom movement.

(2) To familiarize a new crew member with the equipment, the lead lineman locates the equipment in an open area, free of obstructions. He shows the new member the use of the controls, putting the machine through its various movements. Then the new member is allowed, by himself and in the same location, to operate the machine until he is quite familiar with the controls, as well as riding an aerial basket.

(3) The next step is to move

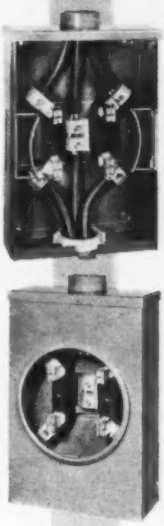
the equipment near a de-energized obstruction (vacant pole or building wall) and demonstrate how to move the basket quickly to within 8 or 10 ft of the object and then creep slowly to it. At the same time, when using the turntable, the lead lineman shows how to watch the location of the boom and elbow so as not to hit obstructions and to always face the direction of movement. The new member is allowed to practice these movements by himself for a short time. (Most employees will become quite familiar with the control of an aerial basket in a very short time.)

(4) Handling of the equipment and performance of work in a safe manner is stressed, with no procedure to be followed that violates existing company rules or safe-working practices:

- The operator shall follow the proper sequence prescribed by the manufacturer in raising or lowering the boom sections.
- The manufacturer's load limits of the boom or basket, marked on the inside wall of the basket, shall not be exceeded.
- With two men in the basket, one man shall be responsible for all movements of the boom.
- Employees working from aerial equipment shall be belted in, either to the fastenings in the Fiberglas baskets or to the skeleton framework of other types.
- All personnel shall stay clear of pressurized oil escaping from a ruptured line or fitting.
- Because the equipment is above the elevation of the cab, any backing of the truck shall be done slowly and only under the direction of one man on the ground having an unobstructed view of the driver and intended path of the vehicle.
- Careful consideration shall be given to the presence and location of overhead conductors and surrounding objects before the truck is moved into the work position.
- The ground at the work location should be carefully examined to insure that truck wheels and outriggers (particularly) will have firm footing. If firm footing is not available for outriggers, planking should be put under each shoe.

Milbank METER SOCKETS

New "TWIN" Series



OUTDOOR

Ringless or Ring Style

4, 5 or 6 Terminal

Featuring New slotted Terminal Jaws permitting cooler operating temperatures. 4/0 Angle connectors—extra wide socket with choice of Hub Sizes. Either style available in any of three heights—9", 10½", or 12". Contains many new features. *Write for Bulletin #89*

Plants in Kansas City, Missouri and Kokomo, Indiana

Milbank Manufacturing Company

1111 VIRGINIA KANSAS CITY, MO.

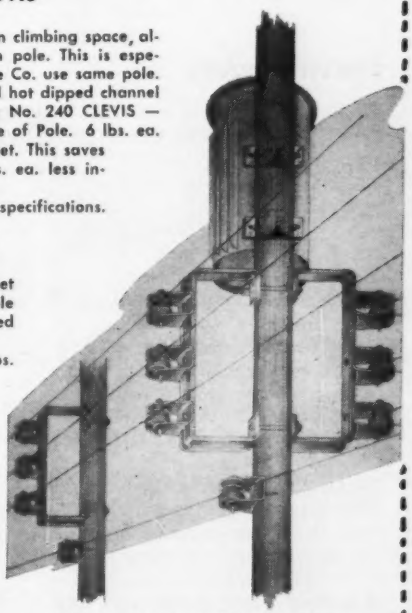
CIRCLE 111 ON READER SERVICE CARD

THIEL Secondary Extension Bracket and Insulator Clevis

Moves wire out from Pole to give lineman climbing space, also uses a minimum amount of space on pole. This is especially desired when Power Co. and Phone Co. use same pole. Has 9" wire spacing and only 22" overall hot dipped channel — 2 x 3/16 x 9/16, when used with our No. 240 CLEVIS — center of Porcelain is out 12½" from side of Pole. 6 lbs. ea. Also furnished with Clevis Weld to Bracket. This saves time of bolting out in the field. 13 lbs. ea. less insulators. No. 350.
Extension bracket will be made to your specifications. Mail us your prints for prices.

Secondary Clevis No. 240

For use with Secondary Extension Bracket or Direct Pole mounting 4" center at hole to back of bracket. 3/16" x 3" hot dipped galvanized with or without insulator.
Wt. 2¼ lbs. ea., 25 pcs. per case, 61 lbs.



Conduit Guard

For covering Fiber or Transit Conduit or Lead Covered Cable on Terminal Pole. Made of 12 Ga. Steel. Hot Dip Galvanized after Fabrication. Length 9 ft.

Cat No.	Conduit Size	Weight Lbs.
103	3"	36
104	4"	44
105	5"	52½

Sold by Leading Electrical Wholesalers

Thiel Tool & Engineering Co.

1417 NORTH MARKET ST. • ST. LOUIS 6, MO.

ELECTRIC UTILITY METHODS

Eum

MANUFACTURERS LITERATURE

To request literature, use code numbers indicated for each item when filling in Reader Service Card

DISTRIBUTION

ESTIMATING LOADS . . . of distribution transformers, from energy consumption, is technically treated. Discussion of load measurement; determination of conversion factor; accuracy of load-factor method augmented by charts and equations. Spring, 1961, issue of Concentration, eight pages. R T & E Corp, Waukesha, Wis. **(151)**

CURRENT-LIMITING FUSES . . . application data for Type EJ, 600 v to 34.5 kv fuses include various mounting arrangements. Cutaway drawings of construction features, table of types of units for indoor and outdoor applications provided. Brochure, GEA-7137, eight pages. General Electric Co, Schenectady 5, N. Y. **(152)**

INSTRUMENTS

PORTABLE TEST SETS . . . portable, with brief descriptions of units for 1) circuit breakers, 2) motor-starter overload relays and small magnetic and thermal breakers, 3) protective relays, 4) oil circuit reclosers, and 5) load boxes (ac adjustable power supplies). Bulletin No. 461, pocket-sized, 16 pages, carries bulletin numbers for more complete data on each. Reply card enclosed. Multi-Amp Div, Multi-Amp Electronic Corp, 61 Myrtle St, Cranford, N. J. **(153)**

INSULATION TESTERS . . . the Meg Type, in the 500 and 1,000-v class—with new extended sensitivities up to 10,000 megohms in the 1,000-v instruments. Descriptions of hand-operated, rectifier-operated, dual-operated, and two-voltage units, drawings, ordering information. Bulletin 21-45, 12 pages. James G. Biddle Co, 1316 Arch St, Philadelphia 7, Pa. **(154)**

INSTRUMENT CONTROL CENTERS . . . layouts and designs provided for any control center, special or standard. Special features include descriptions of simplified planning and ordering, less expensive installation, simplified operation and maintenance, greater safety, modern functional appearance. Monitrol handbook. Atlee Corp, 99 Grove St, Rockland, Mass.

STEAM-PURITY TESTING . . . using the Bantam demineralizer, Model BD-2L, with its disposable resin cartridge. Specifies use with "present" conductivity cells and meter. Describes installation in sampling line so condensate flows through the Bantam en route to test point, conductivity to obtain readings as indication of salt carryover or condenser leakage. Bulletin No. 163, two pages. Barnstead Still & Sterilizer Co, 2 Lanesville Terrace, Boston 31, Mass. **(156)**

TESTING INSTRUMENTS . . . portable electrical test units and general-purpose test instruments—complete line, accuracies, ranges, features, and prices. Catalog, Cir Z-54, eight pages. Daystrom, Inc, Weston Instruments Division, Newark, N. J. **(157)**

DC HIGH POTENTIAL TESTING . . . used in connection with determining the condition of insulation in cables, transformers, rotating machinery, etc. Types of dc Hypot testing, a trade name, are delineated and techniques described. As examples, details are given of a test made on a 13.8-kv, 75-Mva, 60-cycle generator and on a 5-kv cable insulation. There is a section on selection of the proper size high-potential test set. Drawings and graphs are included. How-to-do-it book, not all-inclusive of all tests which can be made, but a tool for techniques, 26 pages, $2.00. Associated Research, Inc, Chicago 18, Ill. **(158)**

POWER PLANTS

STEAM CONTROL . . . and operation at high temperatures detailed in three diagrams. One covers three-element control of two desuperheaters, another the three-element control of burner tilt and two desuperheaters, and the third the effects on steam temperature control by tiling burners and desuperheating. Bulletin 543, four pages. Bailey Meter Co, 1050 Ivanhoe Rd, Cleveland 10, Ohio. **(159)**

HEATING UNITS . . . issued as an appendix to current Chromalox industrial electric heating catalog, No. 60 (for standard items). Contains specifications and product illustrations of Chromalox electric-heater bands, air-heating elements, blower-type heaters, immersion units, engine heaters, mineral-insulated heating cable, special radiant heaters for process and comfort heating, controls and various other elements and equipment. Catalog Supplement CS-600, 24 pages. Edwin L. Wiegand Co, 7500 Thomas Blvd, Pittsburgh 8, Pa. **(160)**

ELECTRONIC AIR CLEANERS . . . heavy-duty, with push-button automatic control, Model PD Precipitron. Sections on: principles of operation, construction features of the unit with its dual-header washing; selection data; and specific application arrangements. Catalog No. 1435, six pages. Westinghouse Electric Corp, Hyde Park, Boston 36, Mass. **(161)**

CENTRIFUGAL FANS . . . feature HS fans, with descriptions of drive arrangements, configurations and types of drives. Discussed and illustrated, also, are specific components such as bearings, dampers, vanes, sound-absorbing bases and drive speed-control devices. Com-

plete working layout dimensions for each fan in the line. Bulletin No. A-1203, 44 pages. American-Standard Industrial Division, Detroit 32, Mich. **(162)**

FLOW METER . . . for solids—details of application for measurement of flow of granular material (such as coal, ore, crushed rock, etc) in vertical ducts, spouts, or pipes. Describes data presentation by means of direct mechanical counter, Type CV6, or by electric contact remote counter, Type CV7. Specification sheet, M22-6, one page. Bailey Meter Co, 1050 Ivanhoe Rd, Cleveland 10, Ohio. **(163)**

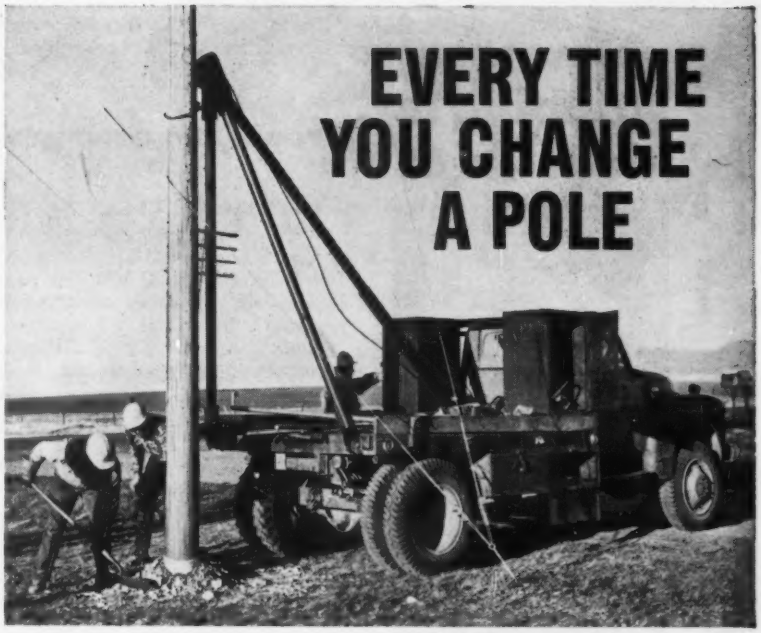
POSITIONER . . . for use with diaphragm or piston-operated control valves and with all types of pneumatic-drive units. Operation is delineated in schematic diagram and methods of mounting on both valve and drive units illustrated. Bulletin 1077, four pages. Blaw-Knox Co, Copes-Vulcan Division, Erie 4, Pa. **(164)**

SAFETY

SAFETY HEADGEAR . . . specifications for electrical workers' insulating safety headgear, approved by Edison Electric Institute's Accident Prevention Committee, cover protection against electric shock and burn and against falling or flying objects. Supersedes AP-1, 1954. AP-1, 1961, four pages, 30¢. Edison Electric Institute, 750 Third Ave, New York 17, N. Y. **(165)**

PROTECTIVE GLOVES . . . and finger cots, with tabulations of their relative resistance ratings to solutions commonly used. Also data on physical characteristics, such as tensile strength and heat resistance, of the Wil-Gard line. The finger and palm finishes, including the Smooth and Firmhold, are described. Wil-Gard Glove Catalog, 20 pages. Wilson Rubber Co, 1200 Garfield Ave, SW, Canton 6, Ohio **(166)**

SAFETY BELTS AND CLOTHING . . . complete line of web belts illustrated and described in Supplement No. 21 (to Stringer Lineman's Equipment catalog), eight pages. Headgear, gloves, boots and suits detailed in Supplement No. 22, 12 pages. Utilities

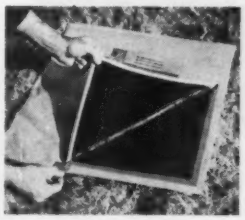


Protect it with a POL-NU® PAK

When a pole is removed from one location and re-set in new earth it is subject to rapid decay and insect attack at the critical ground-line area. Renewal of preservative protection is vital to obtain longest possible service life.

The Chapman Pol-Nu Pak makes it easy for line crews to apply ground-line preservative to "road-moves" and poles being returned to service. It is an envelope-type bandage containing Chapman Pol-Nu, grease-type preservative which gives long-lasting protection.

Pol-Nu Paks are available in several sizes and, because of their convenience, are often preferred for down-the-line treatment of standing poles. Factory sealing of the Pak always insures the proper amount of preservative application for maximum protection without waste. The photos below show how easily it is applied. Mail coupon for data.


Slit Pol-Nu Pak on three sides to expose preservative.

Wrap bandage around pole at ground-line and staple.

Back-filling completes job, assuring longer pole life.

CHAPMAN CHEMICAL COMPANY
Leading manufacturer of wood preservatives • Memphis 1, Tenn.

CHAPMAN®
POL-NU PAK

MAIL COUPON FOR COMPLETE DATA
Chapman Chemical Company
P. O. Box 138, Memphis 1, Tenn.
Please send data on the Pol-Nu Pak to:
Name_____
Company_____
Address_____

No more stopping to clear chips

New Irwin Pole-Bor Bits save time . . . money

Now get easier, faster, non-stop boring action in telephone and power poles. Irwin Pole-Bor bits give continuous chip flow—even in creosoted wood. Special Irwin cutting head, twist angle, and smooth-polished hollows eliminate clogging and binding. Side lip smooths hole for easier insertion of bolts and pins. Heat tempering full length gives extra strength, more safety for the man on the pole.

3 Lengths — 12 Sizes

New Irwin Pole-Bor bits come in 12″, 18″ and 24″ lengths, with 8″, 12″ and 18″ twists. Sizes range from 9/16″ to 17/16″. Use these new Irwin bits for just about any job — whether boring crossarms, small, medium or extra large poles, heavy timbers. And remember: Irwin's patented Adapter Shank fits both hand braces and electric drills. Save time and money. Use fewer bits on the job. Get Irwin Pole-Bor non-stop boring action and extra safety, too. Order from your Irwin distributor today. The Irwin Auger Bit Company, Wilmington, Ohio.

Irwin Adapter Shank fits both hand braces and electric drills

Comes like this with taper square shank for use in hand braces.

Cut off taper square shank. Use in both hand braces and electric drills. No wobble, no run-out.

IRWIN Pole-Bor Bits

Safety Supply Co, Inc, Jefferson St and Highway 50, Lee's Summit, Mo. **(167)**

TOOLS AND EQUIPMENT

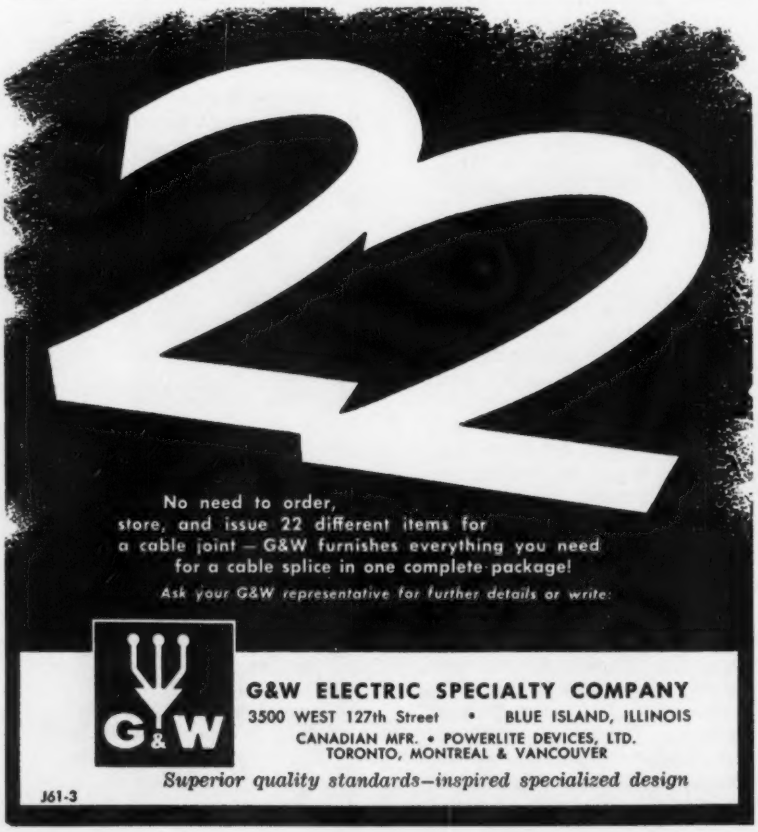
ULTRASONIC CLEANING . . . specifications and applications on Model UG 500/UT 25, UT 55, UT 70, Bulletin C-200, one page. Also on ultrasonic spectroscopy details, folder, six pages. Ultrasonic Systems, Inc, 2255 S Carmelina Ave, Los Angeles 64, Calif. **(168)**

WRENCHES AND HAND TOOLS . . . manual and hydraulic gear pullers, electric drills, sanders, grinders, etc., described in detail. Catalog, 128 pages. Snap-on Tools Corp, 8108 28 Ave, Kenosha, Wis. **(169)**

AUTO FLEET LEASING . . . pros and cons discussed, as compared to company ownership or salesman ownership. Latest data in this third edition. Five tables and charts included which analyze fixed and variable costs at different mileages and effects of different plans on company earnings. Booklet, 28 pages. Foundation for Management Research, 121 W Adams St, Chicago 3, Ill. **(170)**

HYDRAULIC TAMPER . . . use with existing hydraulic power sources and unit's virtually maintenance-free feature described. Details lightweight, aluminum construction, operation as asphalt and frost breaker and for tamping ground in all types of soil. Bulletin, two pages. Truco/Denver, 3963 Walnut St, Denver 5, Colo. **(171)**

AERIAL LIFTS . . . with specific data on each of 30 types of Strato-Tower models available, ranging from 30 to 104 ft. Charts for heights and working capacity. Specifications cover standard and reversing elbow towers, permanently-mounted and detachable units, details on Fiberglas boom. Catalog, Form ST-6101, 16 pages. Equipment Division, Young Spring & Wire Corp, Bowling Green, Ohio. **(172)**


22
No need to order, store, and issue 22 different items for a cable joint — G&W furnishes everything you need for a cable splice in one complete package!
Ask your G&W representative for further details or write:
G&W
G&W ELECTRIC SPECIALTY COMPANY
3500 WEST 127th Street • BLUE ISLAND, ILLINOIS
CANADIAN MFR. • POWERLITE DEVICES, LTD.
TORONTO, MONTREAL & VANCOUVER
Superior quality standards—inspired specialized design
J61-3

READERS SERVICE

For more information on anything in this EUM Report, simply fill out and mail this card ▶

FOR MORE INFORMATION ON...

New Equipment Items — Circle the number corresponding to the one at the end of the item. Fill out and mail.

Manufacturers Literature — Circle the number corresponding to the literature item. Fill out and mail.

Products Mentioned — For more information on any product mentioned in an article (not a New Equipment Item), circle the number corresponding to the one at the end of the article. Fill out and mail.

Products Advertised — Circle on the Reader Service Card the number corresponding to the key number appearing at the base of the ad. Fill out and mail.

PLEASE RETURN THIS CARD WITHIN 30 DAYS TO INSURE RESPONSE

Have you reserved your "Methods" reprints?
If you are not already an Electrical World subscriber, but would like to get the "Electric Utility Methods" Reports, just fill out the return card on the opposite side of this page and we'll reserve them for you. All 6 reprints for only $1.00!

PLEASE MAIL WITHIN 30 DAYS

Readers Service

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36
37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54
55	56	57	58	59	60	61	62	63	64	65	66	67	68	69	70	71	72
73	74	75	76	77	78	79	80	81	82	83	84	85	86	87	88	89	90
91	92	93	94	95	96	97	98	99	100	101	102	103	104	105	106	107	108
109	110	111	112	113	114	115	116	117	118	119	120	121	122	123	124	125	126
127	128	129	130	131	132	133	134	135	136	137	138	139	140	141	142	143	144
145	146	147	148	149	150	151	152	153	154	155	156	157	158	159	160	161	162
163	164	165	166	167	168	169	170	171	172	173	174	175	176	177	178	179	180
181	182	183	184	185	186	187	188	189	190	191	192	193	194	195	196	197	198
199	200																

Name ..... Title .....

Company ..... Dept. .....

Address .....

No Postage Stamp Necessary If Mailed in the United States

BUSINESS REPLY MAIL

First Class Permit No. 64, (Sec. P. L. & R.) New York, N. Y.

Postage Will be Paid by Addressee

Reader Service Department
ELECTRICAL WORLD
330 West 42nd Street
New York 36, N. Y.

ATTENTION

ENGINEERS AND SUPERVISORS

with responsibilities in Construction, Operation, Maintenance, Safety or Stores

YOU NOW HAVE A CHOICE

Be sure of getting your personal copies of Electrical World's new "Electric Utility Methods" Reports—written exclusively for your job needs! It's easier now than ever before . . .

2 ECONOMICAL WAYS TO GET THE "METHODS" REPORTS

1—Reserve your "Methods" Report reprints, and they'll be mailed to you 6 times each year as soon as they're off the press. All 6 for only $1. Or . . .

2—Subscribe to Electrical World for one year at $6, and get the "Methods" features every week for 52 weeks, including the 6 big wrap-up issues like this one!

WHICH IS RIGHT FOR YOU?

If your main responsibilities are in construction, operation, maintenance, safety, or stores, the 6 "Methods" reprints will provide a wealth of job-tested help in return for a very minor investment or . . .

If these areas are only part of broader responsibilities, then you'll get the most from the weekly "Methods" features, plus the 6 "Methods" Reports like this one, plus the whole, detailed industry picture brought to you weekly through the pages of Electrical World!

Fill out and return card today

No Postage Stamp Necessary If Mailed in the United States

BUSINESS REPLY MAIL

First Class Permit No. 64 (Sec. P. L. & R.) New York, N. Y.

Reader Service Department
ELECTRICAL WORLD
330 West 42nd Street
New York 36, N. Y.

Postage Will be Paid by Addressee

You're right, Electrical World! . . .

☐ My job is heavily concentrated in construction, operation, maintenance, safety and stores. I'll get top value from the 6 "Electric Utility Methods" Reports reprints for just $1.00!

☐ I need this "Methods" feature every week, plus everything else in Electrical World. Please enter my subscription for 1 year at six dollars, to start immediately!

☐ Bill company ☐ Bill me

☐ Payment enclosed

Name.....

☐ Home ☐ Business

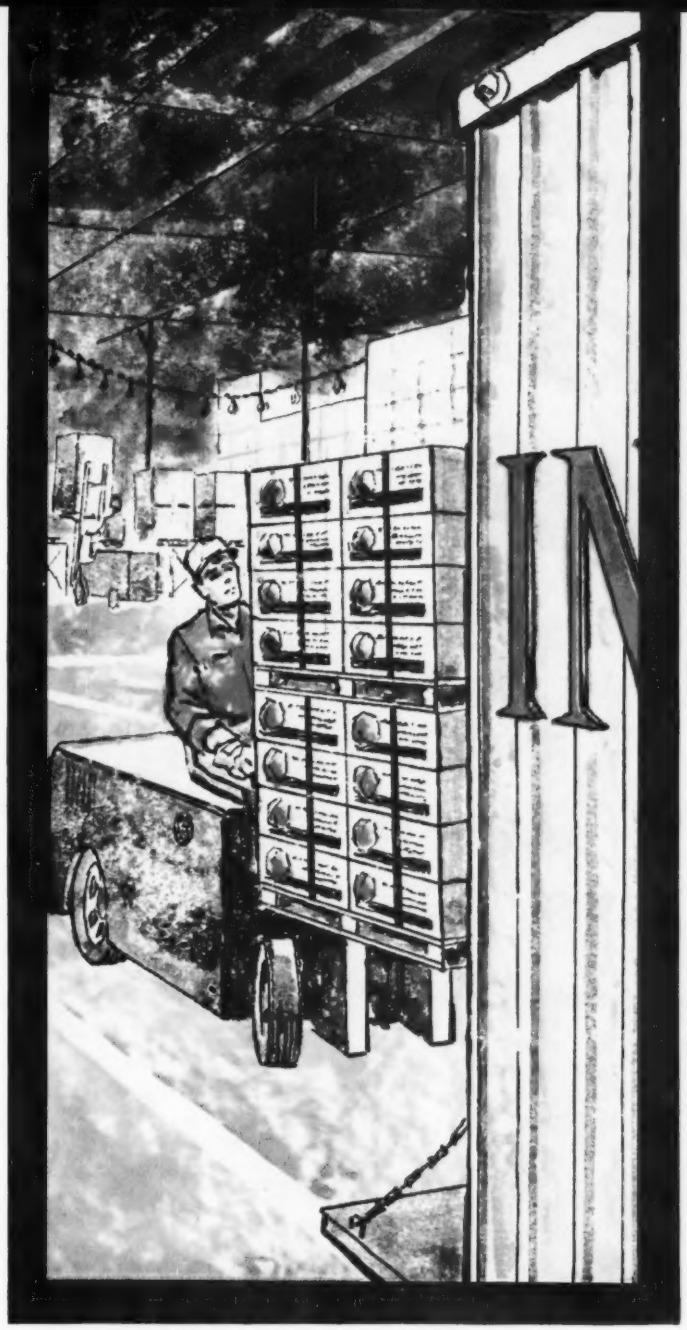
Address.....

City.....Zone.....State.....

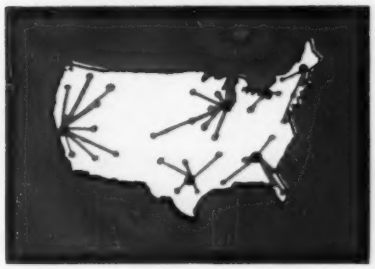
Company.....Dept.....

Title.....

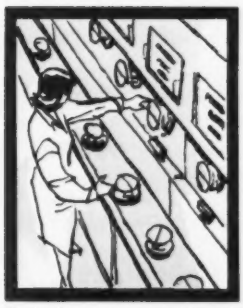
Nature of Company Business.....



41 strategically located warehouses



Computers speed telegraphic punched-tape processing



Production programmed to orders

ANOTHER GENERAL ELECTRIC METERING EXTRA . . .

Overnight delivery from 41 local warehouses

To help you cut metering equipment inventory costs, keep stocks balanced, General Electric's standard high-volume meters, sockets and instrument transformers are available for immediate delivery from 41 stock points in G-E's unique "Jet Stream Service" warehouse system.

New Jet Stream advances mean even faster delivery. For example: single-phase demand meters and transformer-rated single-phase meters not warehouse-stocked are now shipped in only five working days, cut from four weeks. And, polyphase meters are shipped in just six working days.

Here's how Jet Stream Service keeps local stocks of G-E's high-quality metering products available for your needs. Daily, punched-tape reports on sales in each of the 41 warehouses (regional and local) are telegraphed to the factory. By computer processing, the factory (1) directs replenishment of local warehouse stocks from six regional stocks, (2) replenishes regional stocks, and (3) programs production to meet current needs. General Electric's program of best service, plus superior products, adds up to your best metering buy. Get the full story—product and service—from your G-E Sales Engineer. 713-09

YOU GET ALL 10 METERING EXTRAS FROM GENERAL ELECTRIC

- Jet Stream Service
- Statistical Sample Testing Seminars
- Certified Quality
- Meter Courses
- Low Cost per KVA
- Application Assistance
- Product Service
- Load Building Programs
- Industry Communication
- Local Personalized Sales-Service

GENERAL ELECTRIC

CIRCLE 103 ON READER SERVICE CARD

WHY TRIM TREES? IT'S EASIER TO TRIM COSTS!

Olin Conductor's Spaced Aerial Cable Systems—

* COMPRESTO CABLES
* PLM'S ALUMINA SPACERS and
* SHERMAN-REILLY'S CONTINUOUS STRINGING SYSTEM

—can save you money!

Don't cut your consumers' precious trees!

Don't pay needless money for future tree trimming!

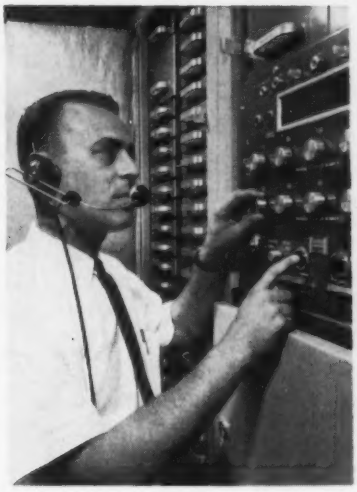
Don't use old-fashioned methods for installing modern spaced aerial cables!

DO contact your Olin Conductor representative for immediate information!

Olin CONDUCTORS

METALS DIVISION, OLIN • P.O. BOX 989 • CHATTANOOGA, TENN.

POWER DIRECTOR makes adjustments for control and billing at operator's console of Philadelphia Electric Co's digital-control economic dispatch system. Adjustment factors are used by the computer to make rapid cost determination of power exchange with interconnections



STARTUP of automatic economic dispatch system at Philadelphia Electric on Aug. 23 marked the first time in the US electric power industry that a digital-computer-directed control system allocated power requirements to individual generators on an incremental cost basis

LOAD CONTROL CONSOLES at individual stations (Southwark) play important roles in computer control that assigns power loads to PE's eight steam and one hydro stations. Consoles permit setting high and low limits on each generating unit and rate of change in generation

PE Inaugurates First Digital Dispatch Computer

Last week, high-speed analog control elements were joined successfully for the first time with a process digital computer to assign electric load generation at minimum incremental cost. The computer-directed control system, developed jointly by Minneapolis-Honeywell Regulator Co and Philadelphia Electric Co for the latter's extensive system, represents a major advance in the application of automatic control for the economic dispatch of electric power.

Integration of the Honeywell 290 industrial-process digital computer into an automatic dispatch control system for PE represents the employment, by Honeywell's electronic data-processing division, of digital techniques proven in large-scale data-processing machines in use for business and scientific applications.

Power Director Sets Stage

Philadelphia Electric is one of eight members of the Pennsylvania-New Jersey-Maryland Interconnection (four other utilities have interconnecting ties) which operates under the principle of equal incremental generation costs and free flow of tie-line power interchange. When the generation level is determined, PE's power director manually adjusts a dial on the control console for total assigned generation. In order to have assignment changes held to a rate equal to system response, the assigned generation signal is first sent through a rate-limiting circuit. A frequency bias component is then added. The resulting signal represents the desired generation, including manual and controlled steam and hydro generation.

Next, the power director sets the level at which loading of hydro generation is to begin—when hydro cost is equal to the cost of the steam generation it replaces. At the same time, he selects the total amount of hydro generation.

Thus, the system allocates steam generation on an economic basis, considering transmission losses, up to the point where hydro loading begins, holds steam load constant while varying hydro generation in this range, and when maximum hydro is reached, assigns all additional increases to steam generation at minimum incremental cost.

Desired steam generation, which is sampled every 10 sec by the computer, is allocated by sending a portion of the total generation change to each unit without regard to economical distribution. As units follow the change, the H290 computer rapidly samples generation and makes new economic calculations which reset the assigned generation among units. While all generators initially start changing load to satisfy changing total generation, the total amount of each unit's generation is determined economically. A rate limiter protects each unit by restricting its rate of generation change.

Involved in the control system are 34 generators—27 units in eight steam stations and seven units in one hydro station—about 3,460 Mw.

Computer is Heart, Nerve Center

The H290 digital computer is the center of the complex control system. Although primarily responsible for allocating steam generation on a minimum incremental-cost basis, it

specify
SHAW-PERKINS
COOLING
RADIATORS
Engineered and built by specialists. Full range of sizes and models, properly designed to give any make or capacity of transformer all the economies of thermo-siphon self cooling.
Valves, flanges, elbows, accessories, for any mounting condition.
Transformer tanks built to customer specification.
Write today for full information.
SHAW-PERKINS
MANUFACTURING COMPANY
201 East Carson St. · Pittsburgh 19, Pa.

NATION'S LARGEST
FEDERAL SAVINGS ASSOCIATION

pays you 4½% on savings

DIVIDENDS PAID QUARTERLY at 4½% current annual rate • World-wide savings service for 170,000 individuals, corporations and trusts in 50 states, 73 foreign countries • Same, sound management policies since 1925 • $40,000,000 reserves • Assets over $650,000,000 Accounts insured by Federal Savings & Loan Insurance Corp. • Man and wife can have up to $30,000 in 3 fully insured $10,000 accounts (2 individual and 1 joint) • Funds received by 10th, earn from 1st • We pay air mail both ways

CALIFORNIA FEDERAL SAVINGS
AND LOAN ASSN. • 611 WILSHIRE BLVD., LOS ANGELES

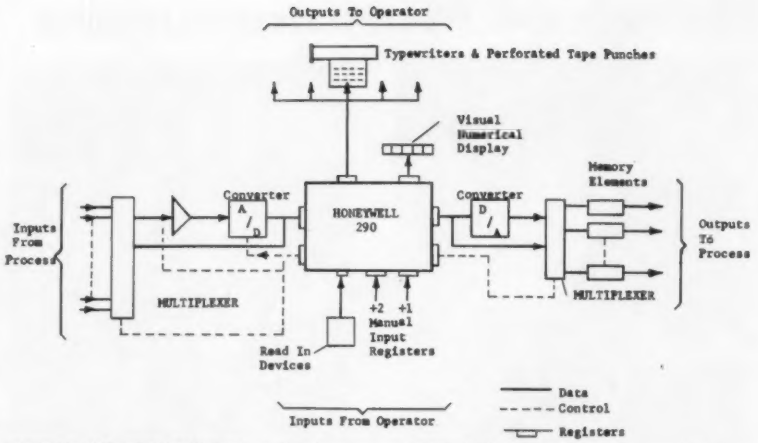
FREE FINANCIAL GUIDE: "The California Story" contains experts' ideas on saving money, investing in homes, insurance, stocks. Other exciting features!

E-1

California Federal Savings & Loan Assn.
Box 54087, Terminal Annex, Los Angeles 54, Calif.

Please send free "The California Story" and Cal Fed MAIL-SAVER® to:

Name _____
Address _____
City _____ Zone ____ State _____
☐ Funds enclosed in amount of $ _____



PERIPHERAL EQUIPMENT of the Honeywell H290 digital computer creates two basic input-output paths, to link the computer, the process and the operator

computes, as a secondary function and on a time-sharing basis with dispatch calculations, data for inter-connection billing. In addition, the computer is available for systems studies and calculations, including maintenance and scheduling on an off-line basis.

Accepted equations for incremental cost of power, which take into consideration transmission losses, are employed in programming the computer for economic dispatch. These equations are applied by the computer so that individual Mw loadings can be determined for each unit on the line not operating at its maximum limit. Thus, total system generation load is allocated at minimum incremental cost.

The H290, a real-time computer, is completely solid-state with parallel internal operation, magnetic core and auxiliary magnetic-drum memories, and a vocabulary with special instructions.

High-speed is obtained through parallel operation, whereby whole words are transferred one at a time rather than bit by bit as in serial-type computers. High speed and a low digital clock rate (50KC) improve reliability.

Peripheral Equipment Links System

The basic function of the peripheral equipment is to link the H290 computer to the control system. It converts such analog signals as tie line power flows and desired generation to the digital language required by the computer. In turn, it translates the computer's digital outputs to analog commands for the control system.

The peripheral equipment, creating two basic input-output paths, links the computer, the process, and the operator. These input-output channels are randomly accessible by the computer, providing more efficient use of peripheral equipment and greater system flexibility.

The load-dispatching control console is located in Philadelphia Electric's dispatching office, along with 10 relay racks and several print-out devices. Manual setters and alarm indicators enable the power director to operate and supervise the entire system. A digital indicator enables the power director to obtain information at any time from the computer. Insertion of information into the computer is performed by a tape reader. Information from the computer is punched on tape and printed out on an electric typewriter.

Execution of the computer's commands between the dispatching offic and generating stations, and control functions around the computer if it is to be by-passed, is the responsibility of the load-frequency control system.

Changes that might occur in total steam generation while the computer is calculating a dispatch are passed around the computer and immediately allocated to units on the basis of their capacity. This makes proportional action around the computer possible.

All unit command signals, whether directly from the computer or bypassed around it, are fed to a high-speed variable frequency telemetering system for transmission to generating stations.

TERESSO® TURBINE OILS GIVE YOU TRIPLE PROTECTION!

Premium-quality Teresso turbine oils are triple-inhibited for protection against rust, foaming, and the formation of harmful sludges. Their high viscosity index minimizes the natural tendency of oils to thin out at high temperatures and to thicken at low temperatures. Entrained water separates readily from Teresso turbine oils.

Teresso has long enjoyed a top position in the lubrication of turbines and other precision machinery. It is manufactured from fine paraffinic-base stocks selected for exceptional oxidation resistance. Advanced refining methods and special additives further its long service life.

UNIVOLT® oils for transformers offer excellent dielectric strength and low power factor. Their high-temperature stability is especially valuable during peak load periods. Your Esso Representative can help safeguard your dependable service. Give him a call, or write to us at 15 West 51st Street, New York 19, New York.

HUMBLE OIL & REFINING COMPANY

DEPENDABLE PROTECTION AT LOW COST

Crapo

GALVANIZED STEEL STRAND

The strong, tough individual wires which make up **Crapo** Galvanized Steel Strand are protected against corrosion by a uniform, tightly-bonded, ductile coating of commercially pure zinc. This heavy, dense coating of zinc, applied by one of the time-proven **Crapo** methods, not only seals out rust but further protects the base metal by sacrificing itself through galvanic action. The result: long and dependable performance at low yearly cost.

A B C

CHOOSE FROM 3 COATING WEIGHTS

Crapo Galvanized Steel Strand is available in three weights of coating, Class A, B and C. Class B has twice the zinc by weight per square foot of wire surface as Class A; Class C has three times that of "A."

Contact the **Crapo** Galvanized Steel Strand distributor near you for prompt shipments from his stock or from our mill.

INDIANA
Steel & Wire Co., Inc.
Muncie, Indiana

Ohio Power Gets Lower Rate

Ohio Power Co is announcing its new rate for electric heating through the use of billboards such as the one pictured above, as well as other media.

The new rate, which will affect 7,000 customers who have all-electric homes, is 1.4¢ per kwhr, compared with the previous rate of 1.5¢ The new charge has been approved by the Public Utilities Commission of Ohio and will apply to those domestic customers whose homes are completely electric, including electric heating and water heating.

The reduction is estimated to bring an average saving of 5% for those customers.

Commenting on the lower rate, A. N. Prentice, vice president and general manager, said, "Ohio Power has never increased its residential rates and, during these times when most costs are going up, it is a real pleasure to be able to lower prices."

He said Ohio Power believes the rate reduction will afford incentive for increased all-electric living. An anticipated revenue loss as a result of the reduction will be compensated eventually by greater volume of energy sales.

A letter to all total-electric home customers whose bills would be larger in some months under the new rate pointed out that this rate was optional. Each individual letter gave the total yearly cost for electricity under the old rate, and what it would be under the new rate.

Concurrently with the public announcement a letter was sent to all Ohio Power employees explaining how the low optional rate will affect employees living in total-electric homes.

Currently there is no adjustment in the fuel clause as the company is still buying fuel at a rate less than that prescribed in the rate schedule.

At the same time as the Ohio Power announcement, the East Ohio Gas Co said it would apply for an increase in gas rates in 108 northeastern Ohio communities.

Texas Hotel Uses Electroluminescence

One of the largest uses of electroluminescence for decorative illumination has been completed at the Rice Hotel in Houston, Texas.

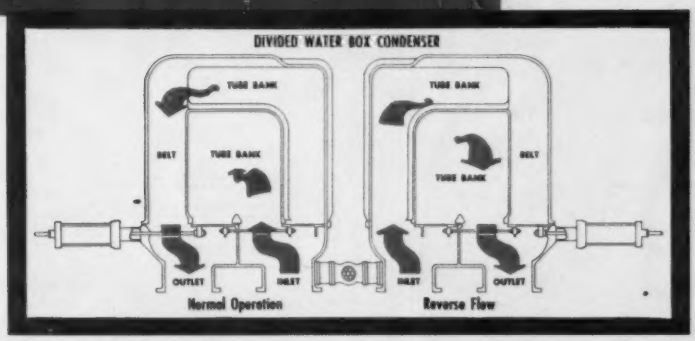
Part of a $5-million redecorating program, the installation is a ceiling of electroluminescent light in the hotel lobby. The installation covers 521 sq ft, consists of 128 individual panels, and is a perfect ellipse 31 ft long. The panels are blue in color to simulate the natural color of the sky.

A diming circuit automatically raises the panels to full brightness as daylight approaches and lowers the light output during the night.

REVERSE FLOW "SELF-CLEANING"

ELIMINATES CONDENSER DOWN TIME

AND CUTS YOUR MAINTENANCE COSTS



C. H. Wheeler "Patented" Reverse Flow Condensers eliminate *manual labor* for cleaning. Refuse, twigs, leaves, debris, algae, or mussels are freed and washed away by back-flushing tubes and tube sheets, without shutting down the condenser.

Reversing can be accomplished during full load operation and full flow of circulating water, without additional pressure drop; hence high vacuum is maintained. Sluice gates for each half of the condenser move on a common stem. They are an integral part of the condenser and no extra external piping is required.

Each half of the condenser can be back-flushed independently or both halves can be flushed simultaneously, with either one or two circulating pumps operating.

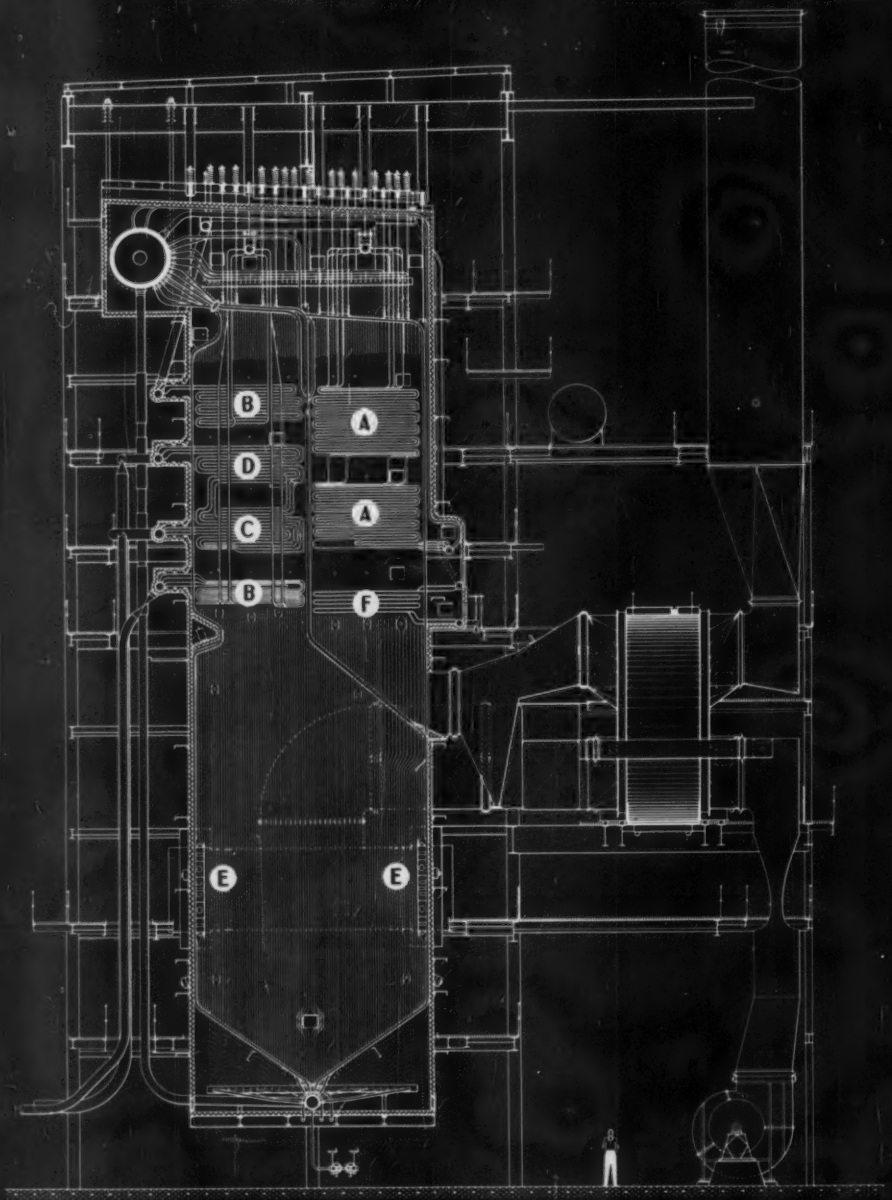
For complete Reverse Flow "Self-Cleaning" story— write for catalog W-503. To know how Reverse Flow "Self-Cleaning" can cut YOUR condenser down time costs—call your C. H. Wheeler representative.

WGR

Affiliated sources for steam condensers, heat exchangers, pumps, nuclear steam generators and related components, sea water distillation plants, marine auxiliary equipment.

C. H. WHEELER Philadelphia 32, Pa. / **GRISCOM-RUSSELL** Massillon, Ohio

COOL WATER . . .



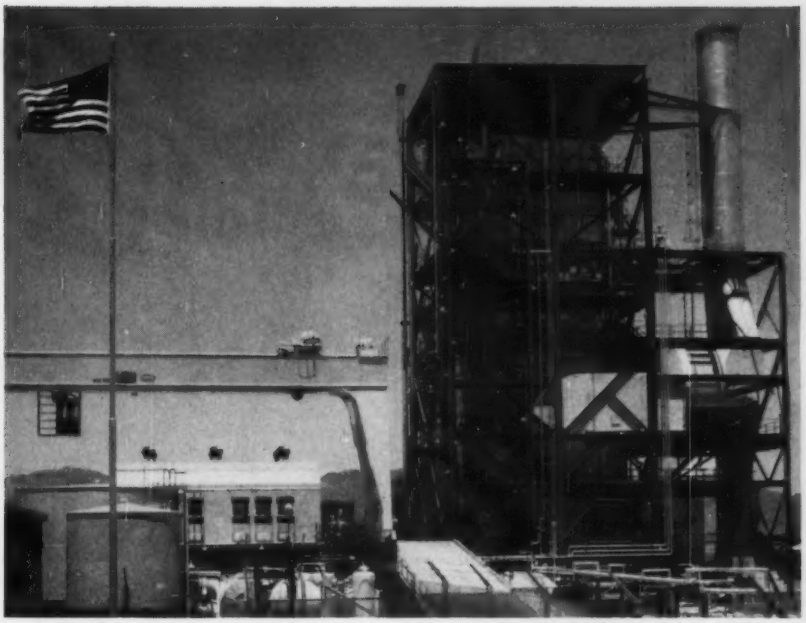
COOL WATER UNIT No. 1

OPERATING DATA:

Primary Steam Flow	475,000 lb/hr
Design Pressure	2,050 psi
Operating Pressure	1,850 psi
Superheat/Reheat	1,005F/1,005F

KEY TO DRAWING

- (A) L.T. Superheater Section
- (B) H.T. Superheater Section
- (C) H.T. Reheater Section
- (D) L.T. Reheater Section
- (E) Tilting Tangential Burners
- (F) Economizer



New Cool Water Steam Plant goes into service

On June 15th, the first of two steam generating units for California Electric Power Company's new *Cool Water* station went into commercial service.

The 62,000 kw capacity of *Cool Water* Unit No. 1 brings the California Electric system's capability to 484,500 kw. *Cool Water* is served by a C-E steam generator of the radiant, reheat design equipped with tilting tangential burners. It is an outdoor-type unit, fired by natural gas and oil with provision for future pulverized coal firing. Cross-sectional elevation and brief description appear on the opposite page.

Cool Water is located 12 miles east of Barstow, California, on a ranch from which it derives its name. Commercial operation of the unit marks the 68th C-E-equipped *new* utility station to go into service since 1950. *Consulting engineers: The Fluor Corporation, Ltd., Los Angeles.*

COMBUSTION C-E **ENGINEERING**

C-331

General Offices: Windsor, Conn.
New York Offices: 200 Madison Avenue, New York 16, N. Y.

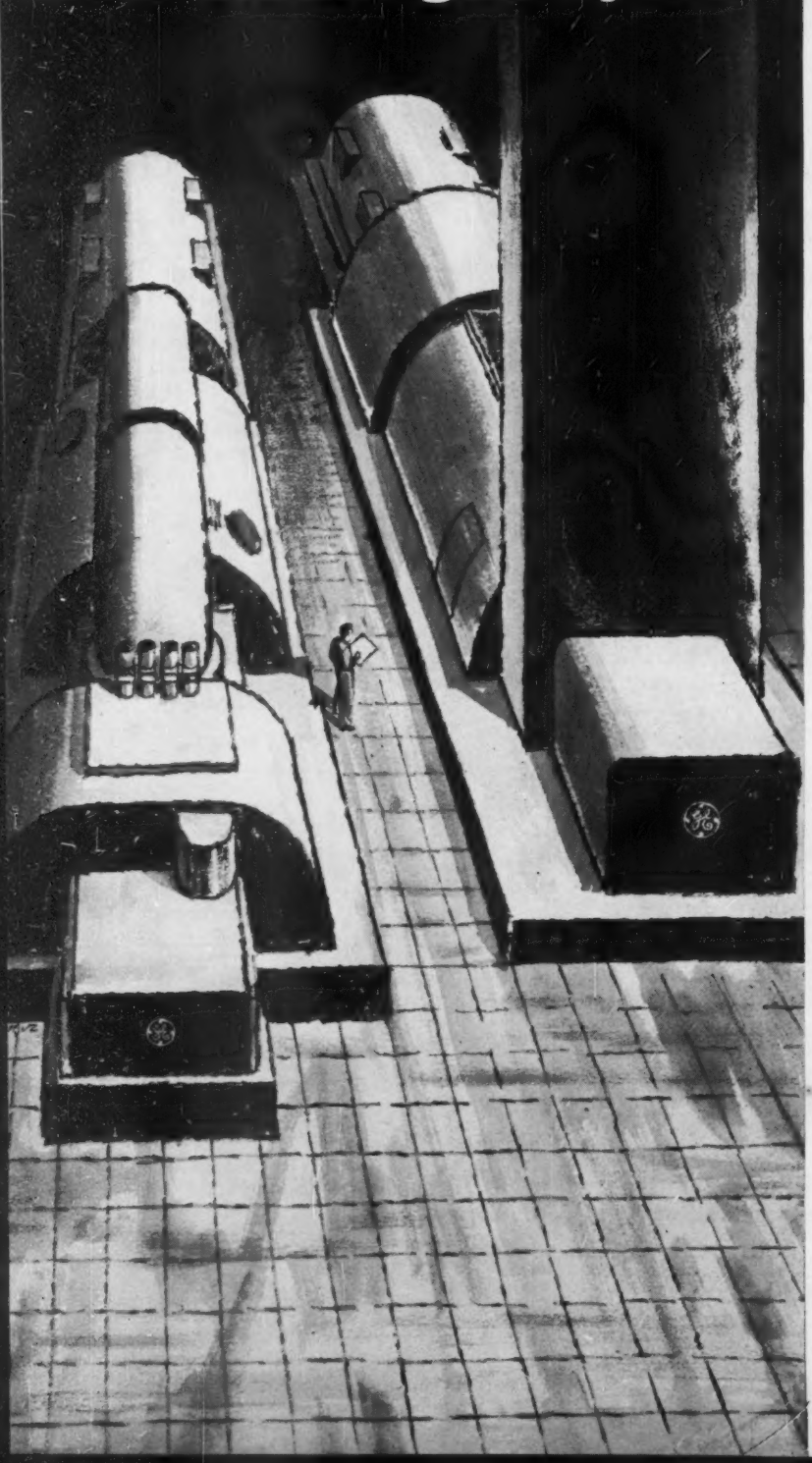
NEW UTILITY STATIONS C-E EQUIPPED

Includes only new stations on new sites placed in operation since JANUARY 1, 1950

1. Lake Catherine
2. Hutchison
3. Yates
4. Dunkirk
5. Titus
6. Lee
7. Contra Costa
8. Hawthorn
9. Ninemile Point
10. Edge Moor
11. Palatka
12. Johnsonville
13. Danskammer
14. Beckjord
15. Highgrove
16. Plant X
17. Black Dog
18. Albany
19. Joppa
20. Meramec
21. Portsmouth
22. Lake Creek
23. Etiwanda
24. Aurora
25. Hennepin
26. Eastlake
27. Oak Creek
28. Suwannee River
29. Urquhart
30. Kingston
31. Sandow
32. Mullergren
33. Barry
34. North Omaha
35. Wilmington
36. Carbon
37. Saguaro
38. Morro Bay
39. Vermilion
40. John Sevier
41. Collin
42. Milliken
43. Canaday
44. Gallatin
45. Barrett
46. Mitchell
47. San Bernardino
48. Yorktown
49. Gulf Coast
50. Tucson
51. Port Wentworth
52. W. A. Parish
53. Allen
54. Montrose
55. McMeekin
56. Lewis and Clark
57. Roy S. Nelson
58. Yuma Axis
59. Dickerson
60. Dan E. Karn
61. Willow Glen
62. Ocotillo
63. Darlington County
64. Port Everglades
65. Nichols
66. Eddystone
67. Brunner Island
68. Cool Water

ALL TYPES OF STEAM GENERATING, FUEL BURNING AND RELATED EQUIPMENT; NUCLEAR REACTORS; PAPER MILL EQUIPMENT; PULVERIZERS; FLASH DRYING SYSTEMS; PRESSURE VESSELS; SOIL PIPE

New steam-gas cycle=



4% gain in generating efficiency

Oklahoma Gas and Electric Company is pioneering the first large steam-gas turbine-generator combined-cycle installation.

This utility has already logged 12 years of successful operation with two General Electric gas turbines in its Belle Isle Generating Station.

Destined for OG&E's Horseshoe Lake Station, the new 237,000-kilowatt steam-gas cycle addition will be placed in service in 1963. Its maximum design efficiency will be 4% better than a comparable conventional steam cycle. Reason: the dual role of the gas turbine.

First, the gas turbine supplies power for its own generator. With 1600 F inlet temperature it develops 26,450 kilowatts.

And second, its exhaust gases provide high-temperature combustion air to the boiler supplying its steam turbine partner.

The gas turbine can be used in combination with a steam turbine regardless of steam conditions. Through "high-temperature topping" it boosts the performance of the entire plant by increasing the maximum temperature at which power is generated.

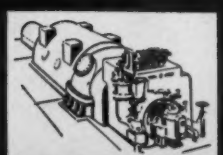
Gas burning combined-cycle power plants employ conventional gas turbines, steam turbines, and boilers available *today* . . . to help reduce the cost of power generation. 244-12

Progress Is Our Most Important Product

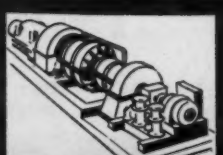
GENERAL ELECTRIC

General Electric Turbine-Generators Help Keep Power Costs Low

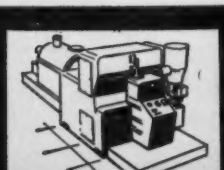
Steam turbine-generators for large blocks of power



Steam turbine-generators 100,000 kw and lower



Gas turbines for peaking, base load, combined cycles



Mechanical drive steam turbines for auxiliaries

Electrical World

AUGUST 28, 1961

Management Newsletter

Will the Federal Deficit Bring Inflation?

On the heels of national concern about recovery comes a new wave of concern about inflation. Recovery from the 1960-1961 setback is now history. Gross national product at the end of this year's second quarter was at $512 billion. July figures for the Federal Reserve Board industrial production index put it at 112. Both of these figures represent new highs for the nation's economy.

But the speed and strength of this recovery can be viewed as a mixed blessing. It means that a vibrant economy will be teaming up with government spending which, in part, was aimed at medicating an ailing economy. The result of this marriage has conjured up the spectre of inflation in the minds of many economists. Add to this the sharp step-up in defense spending announced by President Kennedy last month and you have many of the elements of inflation. Utilities, of course, are watching this situation closely because they won't have the opportunity to get back many of their "inflated" costs, if any, until their next rate review.

It's the extent of this government borrowing, which in its implications for the economy is no different from printing new money, that has started the new concern over inflation. Recent estimates put the fiscal '62 budget some $6.5 billion in the red. This is a sizable sum . . . in fact, it's the second largest deficit that the federal government has run in the past 15 years. Only 1959's staggering $13-billion deficit has been larger.

A large portion of this deficit is due to the nation's expanded defense program. For fiscal '62, the defense outlay will total close to $53.5 billion, up by about $5 billion from the second quarter of this year. How significant is this amount? It may be argued that this $5 billion, and the total deficit of $6.5 billion, are small

when compared with GNP, estimated to be running at $540 billion in the fourth quarter. But the stock market doesn't seem to agree.

The market had looked on calmly while the budget edged further and further into the red, but it was the President's speech on defense spending, carrying with it a big boost in the deficit, that hammered home the threat of inflation. The sluggish market quickly turned bullish, and industrial prices rose to all-time high levels.

But despite the performance of the market, and despite the size of the projected deficit, fear of inflation may be still a bit premature. There are several factors in the economy working against the old cost-price spiral, and even with the new supply of borrowed money injected into the economy by the Administration, these factors may greatly moderate any rise in price.

Most important elements working against inflation are the high levels of unemployment and the idle capacity of American manufacturers. Inflation poses the greatest threat when an economy is working at full capacity. Under such conditions, new demand strains against the limits of supply. This causes manufacturers and distributors to bid up the price of the limited factors of production. But under present circumstances, new demand will be re-employing plants and workers which are currently standing idle. The real danger of inflation will come when the nation reaches full employment. When will that be? There are various estimates.

First of all, it should be noted that the continued high level of unemployment, despite the strength of the recovery, is not unusual. Unemployment usually doesn't begin to fall until several months after a recession bottoms out. In the 1953-54 recession, unemployment reached its peak about four months after GNP turned up. Unemployment levels never returned to the pre-recession level, and it took employment nearly a year beyond the GNP trough to return to pre-recession levels.

In the 1957-58 slump, the peak of unemployment came about six months after GNP had turned up. Again, it was nearly a year before employment climbed back to pre-recession levels.

This year, the employment figure has held up quite nicely. But unemployment remains a serious problem. However, if we follow the historical pattern, we should expect notable reductions in unemployment late in this quarter or early in the fourth quarter.

How extensive will this reduction be? One way of telling is to look at the new jobs that are being created. The military departments, for example, will be adding more than 200,000 men during the next few months. These will be absorbed from the civilian work force. Demand for non-military government workers will increase as a result of rising government activities. Also, private industry will need additional skilled workers as defense spending spills over into the private sector of the economy. To the McGraw-Hill economics department, these facts suggest a cut of about 1 million in the number unemployed. This would mean an unemployment rate of about 5% by mid-winter. But this is still a long way from the 4% figure which economists generally consider to be full employment.

In Washington, the Council of Economic Advisors feels that it is highly improbable that full employment will be reached by the fourth quarter of 1962. The Council extends a trend line from periods in the past when full employment has been attained, and estimates the level of GNP that will be required to give the nation full employment. Its conclusion is that a 15.8% increase in GNP over the level of the current quarter would be necessary. While it is not physically impossible for recovery to proceed that rapidly, the council finds no justification for such an assumption in the past performance of the economy.

A more optimistic estimate comes from Arthur F. Burns, president of the National Bureau of Economic Research. Dr Burns believes that the council's estimate of GNP required for full employment can be no better than the accuracy of its trend line. And he feels that the council's trend line rests on a rather shaky statistical basis. He uses earlier business-cycle expansions as the basis for his investigation and concludes that unemployment should be at about 4.9% in the second quarter of 1962. This is roughly in line with the McGraw-Hill economics department opinion. Dr Burns continues that if the recovery moves with any vigor beyond the second quarter of '62, unemployment may well reach or come close to 4% toward the end of 1962.

While there are differences in these opinions, they all yield one general conclusion. Full employment for the nation is at least a year away, barring any further aggravation of the international situation. Hence, we can expect the unemployment rate to have a mitigating influence on the inflationary spiral for quite some time to come —at least until the end of the current government fiscal year.

Another mitigating influence on inflation is the current overcapacity of the nation's industrial plant. To be sure, this is being corrected by the surge of business activity that marks the recovery. But there's still a lot of correcting left to be done.

The industrial operating rate has been moving up fairly rapidly in the last five months. At mid-year manufacturers were operating at about 83% of capacity compared with less than 75% in February, the bottom of the recession, and 77% at the end of 1960. But even when the operating rate tops 85%, which it should do in the next few months, we will still have considerable spare capacity. Companies prefer to operate at about 94% of capacity, so there will still be a gap of nine points between the 85% operating rate and the 94% preferred rate. When industry begins operating above 90%—a situation which may be as much as 12 months away—then the inflationary pressures will reach the boiling point and push hard against the lid.

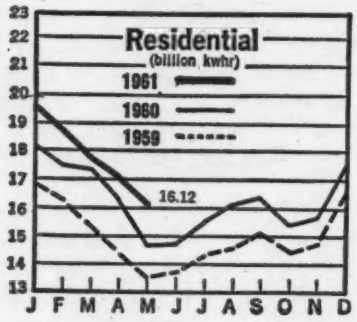
According to the McGraw-Hill economics department, the high unemployment and excess industrial capacity "should easily absorb the additional $5 billion in defense spending on top of the business recovery." The department concludes that prices may rise somewhat during the coming year, but the increases will probably average about 1½%, a percentage not normally considered inflationary in an expanding economy.

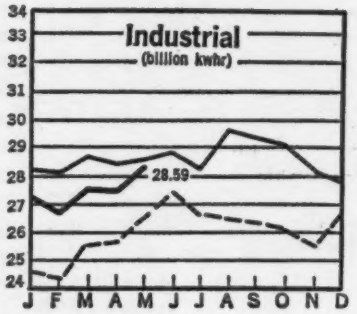
The Administration, however, has made it clear that most of its expenditures are not of a temporary nature. The current boost in defense, for instance, is only the beginning of a long military buildup which will last beyond the Berlin crisis. Thus, there is no indication that the budget will be reduced in fiscal '63. Then, assuming that the recovery continues, we will not only have the coincidence of high spending and a high level of business activity, but we will also have an economy working at high levels of employment, and close to the preferred operating rate. This will be the period of maximum inflationary pressure.

President Kennedy, however, has emphasized that for fiscal '63, he intends to submit a budget "strictly in balance." Hopefully, this budget will be balanced out of the greater revenues which the Administration has long predicted the present tax structure would yield. If this doesn't happen, then the President has hinted strongly that taxes will rise. In either case, the added pressure of borrowing on the banking system will be removed.

Washington has soft-pedaled the threat of inflation for fiscal '62. Perhaps correctly, for unemployment and industrial slack are working against it. But in fiscal '63, the Administration will have to step down hard if inflation is to be avoided. Today the economy is working with the government to fight inflation. In '63, the economy will no longer be able to lend a hand.

Monthly Sales of Electricity . . . through May





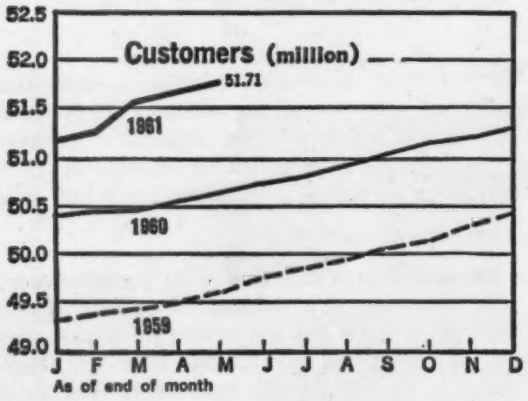
SOURCE: EDISON ELECTRIC INSTITUTE

Power Statistics . . . through May

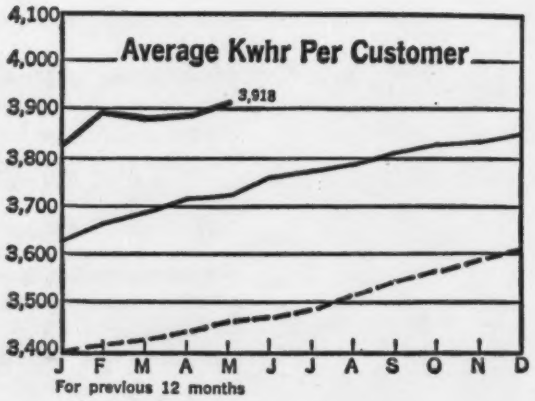
	Latest Month	Year Ago	Annual Change %
Capacity..... million kw.....	172.16	161.28	6.7
Total Production..... billion kwhr.....	63.66	60.34	5.5
Hydro.....	14.01	13.04	7.4
Fuel.....	49.65	47.30	4.9

SOURCE: FEDERAL POWER COMMISSION

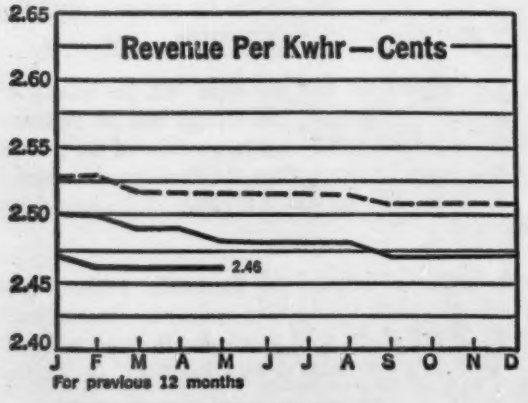
Residential . . . through May



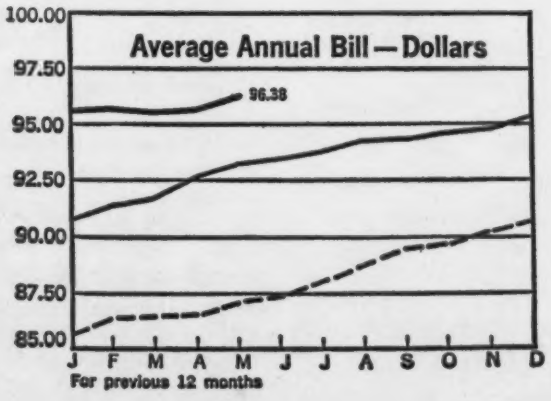
As of end of month



For previous 12 months



For previous 12 months



For previous 12 months

SOURCE: EDISON ELECTRIC INSTITUTE

News About People

Morrison Named President

MORRISON CARGILL

Gulf States Utilities Co has elected John J. Morrison to succeed Roy S. Nelson as president. Ralph E. Cargill was appointed executive vice president. Nelson continues as chairman of the board and principal executive officer.

Morrison has been with the utility since 1947. He became a vice president in 1954, executive vice president in 1955, and has been a director since 1957.

Cargill, with Gulf States since 1925, has been a vice president six years. He is also a director.

KEENAN ▶

Keenan Boosted to Vice President

Charles H. Keenan has been appointed a vice president of Yankee Atomic Electric Co.

Keenan joined Yankee Atomic Electric three years ago as assistant to the vice president. Later that year he became assistant vice president, the position he has held until his recent promotion. His headquarters will continue to be the Boston office.

Rowell Picked as Vice President for New England Utility

Fred M. Rowell has been named to become a vice president of New Bedford Gas & Edison Light Co in October and succeed Peter C. Dirksen as general manager when Dirksen retires in February 1961.

Dirksen will continue as a vice president and consultant until August 1961, and as a director.

Rowell will relinquish his post as general manager of Cape & Vineyard Electric Co but continue as a vice president there.

The New Bedford utility and Cape & Vineyard are part of the New England Gas & Electric Assn.

◀ ROWELL

PERSONAL BRIEFS

Virginia Electric & Power Co has appointed **John M. McGurn** as operating manager. He replaced **Walter J. Matthews** who resigned to become executive vice president of Public Service Co of Indiana (EW, Aug. 7, p 74).

Henry H. Startzman has retired as vice president of Potomac Edison System.

Ferol E. Betz has been named industrial relations manager for Puget Sound Power & Light Co.

Georgia Power Co has promoted **James H. Lockhart** to chief distribution engineer, succeeding the late **Rhea W. Baker. Herbert C. Woodson** replaced the late **Robert J. Cooper** as operating manager.

Niagara Mohawk Power Corp has organized a new system sales staff comprising seven managerial positions. The newly appointed staff managers are: **Lawrence B. Carney,** sales training; **O. Mark DeMichele,** advertising; **Coburn D. Hollister,** commercial sales; **Walter J. Stepien Jr,** industrial sales; **Donald E. Vincent,** residential sales; and **Kenneth C. Whyland,** service.

West Penn Power Co has named **Luther S. Singley** administrative assistant-office of the president.

Paul F. Allmendinger has been appointed engineering director of Electric Autolite Co's electrical products group.

Electric Storage Battery Co has boosted **Vern G. Zeller** to vice

president in charge of foreign operations.

Robert P. Bennett has been appointed manager of the new relay marketing department at Cornell-Dubilier Electronics division of Federal Pacific Electric Co. **Earl F. Olsen** succeeded Bennett as engineering manager of electro-mechanical products.

Triangle Conduit & Cable Co, Inc, has named **Harry H. Martin** as vice president in charge of operations.

Bearinger Promoted by M-H

Dr Van W. Bearinger has been appointed general manager of Minneapolis-Honeywell Regulator Co's semiconductor division.

SALES ASSIGNMENTS

COMPANY STAFFS

Union Carbide Plastics Co, division of Union Carbide Corp, has assigned James N. Barton as technical sales representative in the western sales region. Frank G. Bertics became assistant regional sales manager in the midwestern sales region.

Graybar Electric Co, Inc, has named D. E. Clisbee as acting manager of the Gulf Coast district, with headquarters in Houston, Texas. He replaces V. R. Young who will retire.

Electric Autolite Co has made Irving P. Siminoff national accounts manager for the West Coast district.

Allis-Chalmers Manufacturing Co has made James W. Snarr manager of processing industry sales, Chicago district, for the industries group. He succeeded H. W. Schaub who became midwest accounts manager for the new cement industry department.

General Electric Co has named James H. Morrison sales representative for the western sales district of the silicone products department. W. L. Batty Jr became western district manager for the department.

Babcock & Wilcox Co has made three appointments in the sales department of its boiler division. Seth M. Snyder became Pittsburgh district sales manager, succeeding W. I. Collins who retires. Joel W. Thompson was named Charlotte, N. C., district sales manager, and James E. Roberson became Cincinnati, Ohio, sales engineer.

H. K. Porter Co, Inc, has made the following appointments in its National Electric division: W. J. McMillan, Los Angeles branch manager; W. D. McGaffic, Chicago branch manager; and E. J. Campbell, Buffalo branch manager.

REPRESENTATIVES

Bishop Manufacturing Corp has made Harlan J. Weisler Associates of St. Louis a representative.

Southern States, Inc, has appointed K. H. Newberry Co as manufacturer's representative for the Upper Peninsula of Michigan.

Fisher-Pierce Division of Sigma Instruments, Inc, has appointed Low Associates as sales representative, covering Delaware, eastern Pennsylvania, southern New Jersey, and the eastern shore of Maryland.

Accurate Manufacturing Co has named Fred C. Baldridge Co as representative in Arkansas and Louisiana.

Rodger, Former Salesman for EW, Dies

John M. Rodger Sr, formerly Cleveland salesman for *Electrical World,* has died. Rodger was 79 years old.

He joined McGraw-Hill Publishing Co in 1914 and subsequently served with EW as Cleveland salesman. In 1918 he was transferred to Chicago, where he became office manager in 1923.

Between 1923 and when he retired from the company in 1950, Rodger served in numerous McGraw-Hill executive and administrative posts, including Midwest regional vice president.

Letters (*Continued from page 5*)

vast extent of "catching up" that is inherent in such comparisons.

Installed Generating Capacity (Millions of Kw)

	USSR	US	USSR as % of US
1958	53.4	167	32%
1959	58.9	181	32%
1960	—	193	—
1965	114	265	43%
1970	196	355	55%
1975	323	485	67%
1980	490	640	77%

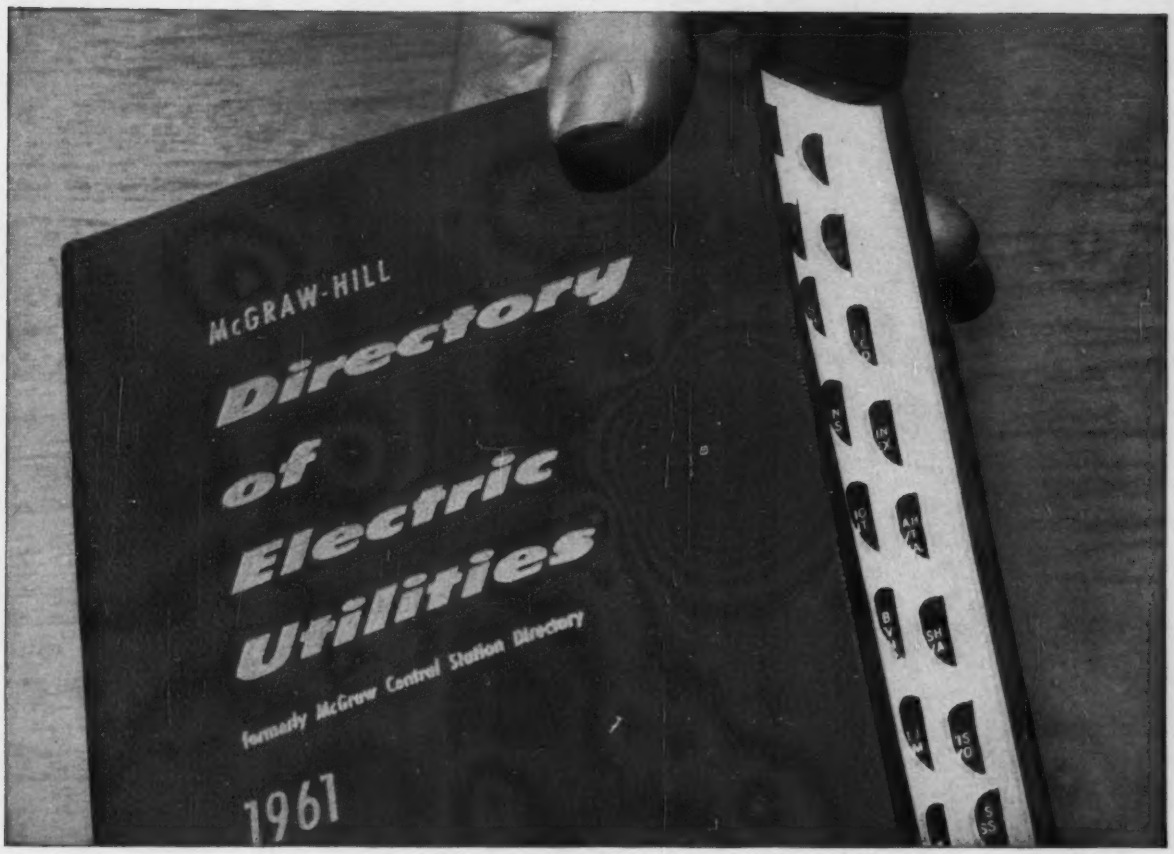
True, the Soviets may not achieve their plan, but even if they fail by a substantial margin, the economic gap in the field of electric power production, at least, may be significantly narrowed.

Furthermore, there is no necessary reason to believe that the USSR's planned increase in electric production capacity may not be achieved. Certainly, in other fields Soviet advances have been continuous and purposeful.

In the over-all energy field, for instance, the Soviets have consistently met and bettered their recent five-year and seven-year plans. . . . In addition, Soviet strides in the natural gas field have been tremendous, production in 1960 having more than quadrupled what it was in 1955. In the past five years Soviet production of coal has overcome and surpassed the declining production of the US.

With all of these significant economic strides, the US is still "out ahead." The data presented by Sporn, however, indicates that in the realm of electric energy production, as in other fields, there is clearly no cause for complacency. In this field, also, the USSR must therefore stand as a more formidable opponent perhaps than any of us has yet envisioned.

Henry F. Lippitt, 2nd
Los Angeles, Calif.



Look here... before you visit, write, phone or study Electric Utilities

New, 1961 edition gives 3½ times as many items—in easier-to-find form.

Phone numbers and area codes have been added. New census data. Also new titles including nuclear, manager of rates, of street lighting, of stores, of area development, superintendents, of meters, of substations, of transportation, manager of public relations—and fourteen engineering officials.

New customer data:

Numbers of residential, industrial, commercial and rural customers; average residential rates and use. Total sales. All new this year.

New Sales and Capacity data:

New system input, number of bulk power substations and total kva, distribution substations and total kva, transmission voltages and circuit miles, underground cable miles, summer and winter peaks, net generations for each plant, capacity and fuel of each unit... including REC's and municipals.

Prices: U.S. and Canada, bound in tough, flexible leatherette — $55. (10% discount on 5 or more). Same, but unbound and easily separated into States, Canada, etc. — $55. U.S. Possessions — $3. Canada — $10.

State sections available separately *only* on orders for 1 or more complete U.S. and Canada directories.

At $5.00 each	At $8.00 each
Alaska	California
Arizona	Illinois
Delaware	Indiana
D. C.	Iowa
Hawaii	Massachusetts
Idaho	Michigan
Montana	Minnesota
Nevada	New York
New Hampshire	Ohio
New Mexico	Pennsylvania
North Dakota	Texas
Rhode Island	Wisconsin
Wyoming	

All other states — $6.00 each

McGraw-Hill Directory of Electric Utilities
330 West 42nd St., New York 36, N.Y.

☐ Please send more information and specimen pages.
Please reserve the following:

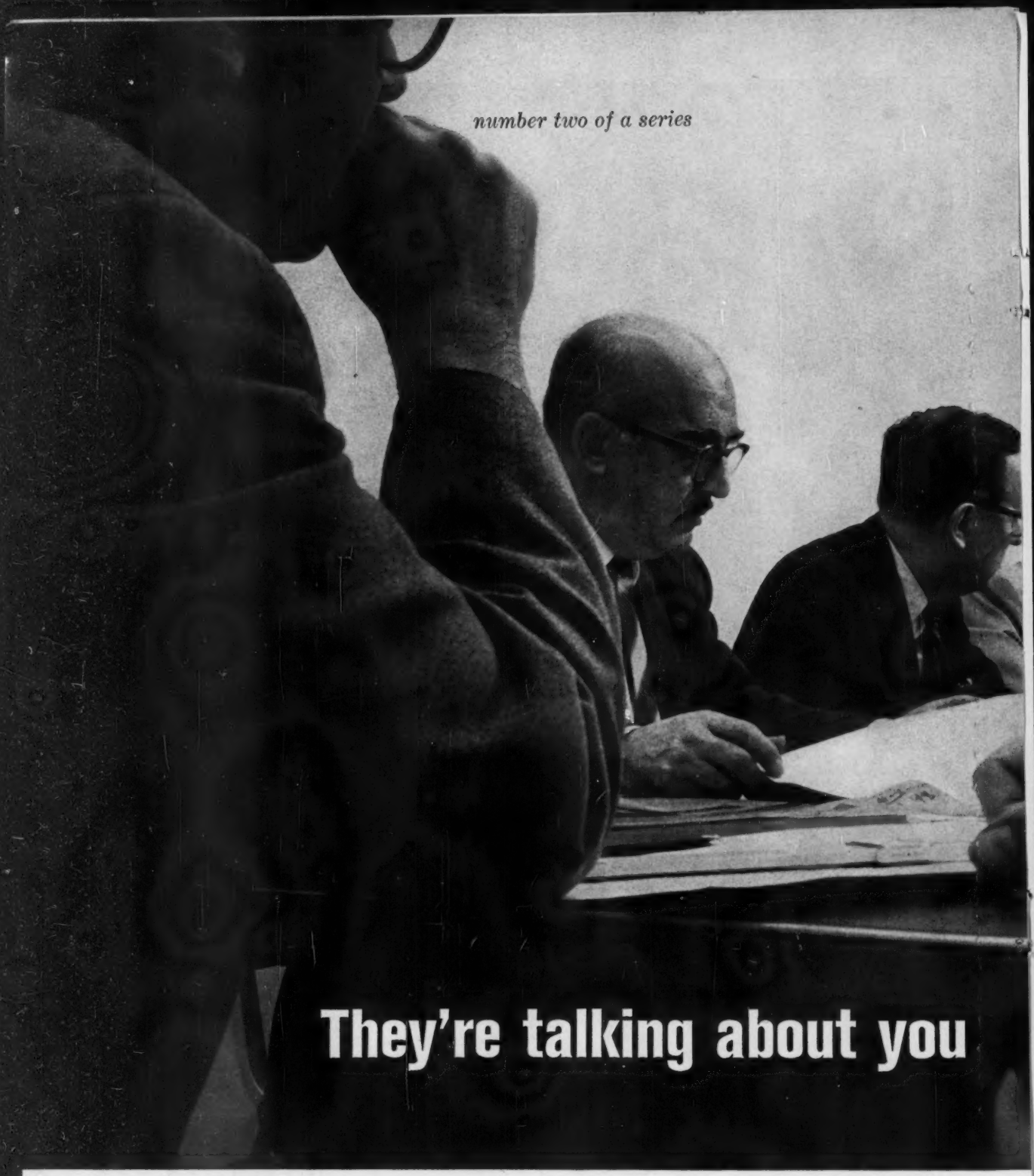
No. of copies	Areas covered	No. of copies	States
_____	U.S. and Canada (bound)	_____	_____
_____	U.S. and Canada (Unbound)	_____	_____
_____	U.S. Possessions only	_____	_____
_____	Canada only	_____	_____

Your name and title _____

Company _____

Street _____

City and State _____



number two of a series

They're talking about you

...about your company, your product, your proposal.

You can't get into the meeting, yet of these seven men your salesman has called on only three. Two wouldn't see him, one is new since his last call, the seventh is subbing for his boss. What are your chances?

The design, price, and specific proposal your salesman has presented are important. But much depends, too, on the over-all impression your company has made on these men over the years... an impression based on sales calls, your literature, your advertising.

For research shows that much of the industrial buyers' information comes to them through advertising*... that your salesmen cannot seek out and regularly contact all the people who influence the purchase of your product.** Too, the frequency of your sales calls is seldom ideal, and the number of influences on purchasing decisions is growing constantly. What's the answer?

*McGraw-Hill Laboratory of Advertising Performance Reports *5101 and **1023.*

It lies in better use of *sales communication in print*, concentrated in your market's first-choice medium. If you sell to electric utilities and big industrial power systems, this means Electrical World... a salesman who calls when your man can't... on contacts he doesn't yet know are important to him. Electrical World is a salesman with a welcome, and 52 confirmed appointments every year in the offices of the men you have to sell.

Beef up your sales team... hire Electrical World!

a McGraw-Hill Businesspaper

Electrical World

the electrical industry's weekly magazine

PROFESSIONAL SERVICES

CONSULTING · DESIGN · EXAMINATIONS · APPRAISALS
CONSTRUCTION · PLANS · SURVEY · REPORTS

AMERICAN AIR SURVEYS, INC.
- Aerial Topographic Maps & Photos
- Plan & Profile for Transmission Lines
- Base Maps of Service Areas
- Topographic Maps for Reservoir Studies
- Coal Stock pile Volumes by Aerial Method

907 Penn Avenue Pittsburgh 22, Pa.
Offices—Manhasset, N. Y.—Atlanta, Ga.

BLACK & VEATCH
Consulting Engineers
Water—Electricity—Gas—Sewage—Industry
Reports, Design, Supervision of Construction
Investigations, Valuations and Rates
1500 Meadow Lake Parkway Kansas City 14, Mo.

THEODORE D. BROSS LINE CONSTRUCTION CORP.
Steel Tower & Wood
Transmission Lines
Distribution & Maintenance
175 Endfield St. Hartford, Conn.

BURNS and ROE, Inc.
Engineering and Design • Reports • Surveys
Construction • Electric, Steam, Hydro Plants
Transmission • Distribution • Aeronautical
Facilities • Research and Development • Nuclear,
Chemical, and Industrial Plants
160 West Broadway • New York 13, N. Y.

COMMONWEALTH SERVICES INC.
Management and
Business Consultants
300 Park Ave.
New York 22, N. Y.

ASSOCIATES INC.
Consulting and Design
Engineers
209 E. Washington
Jackson, Michigan

DAY & ZIMMERMANN INC.
Engineers
Design—Construction
Transmission—Distribution Lines
Reports—Valuations—Rates
New York PHILADELPHIA Chicago

DOBLE ENGINEERING COMPANY
Consulting Engineers
Field and Laboratory Testing of Solid and Liquid
High Voltage Insulation. Research on Power Sys-
tem Electrical Operating Characteristics and
Problems.
Office and Laboratory: Dobie Park
Box 106, Belmont 78, Mass. (6 miles from Boston)

GIBBS & HILL, Inc.
Consulting Engineers—Designers—Constructors
Steam, Hydroelectric, Gas-Turbine & Nuclear
Power Generation—Electric Transmission & Distri-
bution Systems—Power Surveys, Reports & Con-
tracts—Industrial, Transportation & Communica-
tion Facilities—Water & Waste Treatment Works.
Pennsylvania Station New York 1, N. Y.

WHEN TIME IS SHORT . . .

put the solution of your problems up to a specialized Consultant. His broad experience may save you months of costly experimentation.

GILBERT ASSOCIATES, INC.
Engineers and Consultants
DESIGN
SUPERVISION OF CONSTRUCTION
BUSINESS AND ECONOMIC RESEARCH
READING, PA.
Washington New York

HARZA ENGINEERING CO.
Consulting Engineers
Hydroelectric Plants and Dams
Transmission Line
Flood Control, Irrigation
River Basin Development
400 West Madison Street Chicago 6

HOOSIER ENGINEERING COMPANY
Erection and Maintenance of
Electrical Transmission and Distribution Lines
1350 Holly Avenue, Columbus, Ohio

JACKSON & MORELAND, INC.
JACKSON & MORELAND INTERNATIONAL, INC.
Engineers and Consultants
Electrical—Mechanical—Structural
Design and Supervision of Construction for
Utility, Industrial and Atomic Projects
Surveys—Appraisals—Reports
Technical Publications
Boston Washington New York

JENSEN, BOWEN & FARRELL
Engineers
Appraisals—Depreciation Studies—Property Records
Cost Trends—Special Studies—Reports
for Rate Cases, Security Issues, Regulatory and
Accounting Requirements
Michigan Theatre Building Ann Arbor, Michigan
NOrmandy 3-7778

THE KULJIAN CORPORATION
Engineers - Constructors - Consultants
POWER PLANT SPECIALISTS
(Steam, Hydro, Diesel)
Utility • Industrial • Chemical
1200 N. Broad St., Philadelphia 21, Pa.

PETER F. LOFTUS CORPORATION
Design and Consulting Engineers
Electrical • Mechanical • Structural
Civil • Nuclear • Architectural
First National Bank Building
Pittsburgh 22, Pennsylvania

CHAS. T. MAIN, INC.
Engineers
Electric, Steam and Hydraulic Projects,
Investigations, Reports, Appraisals
Design and Construction Supervision
Boston, Mass. Charlotte, N. C.

PIONEER SERVICE & ENGINEERING CO.
Consulting and Design
Engineers—Purchasing
Specialists in Financing
Accounting and other Operations
231 So. La Salle St. Chicago 4

SARGENT & LUNDY
Engineers
Consultants to the Power Industry
STUDIES • DESIGN • SUPERVISION
140 South Dearborn Street, Chicago 3, Ill.

TIPPETT & GEE
Consulting Engineers
Mechanical • Electrical • Thermodynamic
Structural Design • Studies • Supervision
Power Stations • Transmission • Distribution
Industrial Plants • Process
133 North Second Street Abilene, Texas
214 Meadows Building Dallas, Texas

UTILITIES LINE CONSTRUCTION COMPANY, INC.
Construction and Maintenance
Transmission - Distribution
Electric and Telephone Lines
Consultants
505 York Road Jenkintown, Pa.

VERNON GRAPHICS, INC.
Mount Vernon, N. Y.
MO 4-7117

VERNON GRAPHICS OF PA. INC.
Norristown, Pa.
Broadway 9-3000

CONSULTING AND SERVICING UTILITIES
ON MAPS, RECORDS AND FIELD INVENTORY

A. W. WILLIAMS INSPECTION CO.
INCORPORATED
Specialized Inspection Service
Poles, Crossarms, Lumber, Piles, Crossties
Preservative Treatment and Preservative Analysis
208 Virginia St., Mobile, Ala.
New York St. Louis Portland
Inspectors stationed throughout the U.S.A.

SEARCHLIGHT SECTION

(Classified Advertising)

EMPLOYMENT: BUSINESS: "OPPORTUNITIES" :EQUIPMENT :USED OR RESALE

DISPLAYED RATE: —RATES— **UNDISPLAYED RATE:**

EMPLOYMENT OPPORTUNITIES: $25.50 per inch. Subject to Agency Commission.

EQUIPMENT & BUSINESS OPPORTUNITIES: $16.85 per inch for all advertising appearing on other than a contract basis. Not subject to Agency Commission.

AN ADVERTISING INCH is measured 7/8 inch vertically on one column, 3 columns—30 inches—to a page.

EQUIPMENT WANTED or FOR SALE ADVERTISEMENTS acceptable only in Displayed Style.

$1.80 a line, minimum 3 lines. To figure advance payment count 5 average words as a line.

PROPOSALS, $1.80 a line an insertion.

BOX NUMBERS count as one line additional in undisplayed ads.

DISCOUNT OF 10% if full payment is made in advance for four consecutive insertions of undisplayed ads (not including proposals).

Send New Advertisements to Classified Advertising Div. of Electrical World, P. O. Box 12, N. Y. 36, N. Y.

ADDRESS BOX NO. REPLIES TO: Box No. Classified Adv. Div. of this publication. Send to office nearest you.
NEW YORK 36: P. O. Box 12
CHICAGO 11: 645 N. Michigan Ave.
SAN FRANCISCO 11: 255 California St.

POSITIONS VACANT

Three Chief Operators with Public Utility experience for 80,000 KVA Hydroelectric Plant in East Pakistan. One year contract at $1000 per month with subsistance, housing and transportation furnished. All qualified applicants will be considered without regard to race, creed, color or national origin. Send resume of experience to Utah-Pakistan Inc., 221 Pine Street, San Francisco, California.

Permanent openings for Resident Engineers experienced in supervision of construction of large steam power plants and/or high-voltage transmission lines. Degree and registration desirable. Excellent opportunity with consulting engineering firm. Please send resume of education and experience and salary requirements to P-7230, Electrical World.

Industrial Power Sales Engr.—Graduate electrical engineer for Sales Dept. of northern Illinois utility. Duties as utility technical representative to local industrial and commercial firms re: power requirements and related problems. Good personality, active military obligation should be completed. Write stating age, experience and salary expected. P-7187, Electrical World.

Put Yourself in the Other Fellow's Place

TO EMPLOYERS - TO EMPLOYEES

Letters written offering Employment or applying for same are written with the hope of satisfying a current need. An answer, regardless of whether it is favorable or not, is usually expected.

Mr. Employer, won't you remove the mystery about the status of an employee's application by acknowledging all applicants and not just the promising candidates.

Mr. Employee you, too, can help by acknowledging applications and job offers. This would encourage more companies to answer position wanted ads in this section.

We make this suggestion in a spirit of helpful cooperation between employers and employees.

This section will be the more useful to all as a result of this consideration.

Classified Advertising Division

McGRAW-HILL PUBLISHING CO., INC.
330 West 42nd St., New York 36, N. Y.

TRANSFORMERS

3—2500 KVA G-E 69000—2400/4160Y
3—2500 KVA G-E 69000—7200/12470Y
4—2500 KVA W-H 34500—2400/4160Y
3—1500 KVA G-E 69000—2400/4160Y
3—1500 KVA G-E 69000—7200/12470Y
3— 500 KVA A-Ch 2400/4160Y—240 x 480
3— 500 KVA A-Ch 7200/12470Y—240 x 480
3— 500 KVA A-Ch 13200—240 x 480
3—1000 KVA G-E 34500-7200/12470Y
3—1000 KVA Wag. 34500—2400/4160Y
3— 833 KVA W-H 43800—480
3— 500 KVA A-Ch 13800—240x480
3— 333 KVA W-H 13200—2400/4160Y
3— 333 KVA G-E 2400/4160Y—240/480
3— 333 KVA Wag. 2400—120/240
1—1500/1875 KVA Mol. 3-Ph. 34,500—2400 F/C equipped

TRANSFORMERS WANTED

THE ELECTRIC SERVICE CO.
5316 Hetzel St.
Cincinnati 27, Ohio
47 Years' Dependable Service

UTILITIES ENGINEER

The City of Lakeland, Florida, Department of Electric and Water Utilities, is accepting applications for position of Utilities Engineer. Applicants must have degree in electrical engineering; registered or capable of being registered in State of Florida. At least five years experience in supervisory or technical staff responsibilities in private or public utility plant. At least ten years experience in engineering capacities of design and programming nature. Excellent opportunity. Salary $10,000 to $12,000. Retirement, leave and insurance benefits. Contact Emory E. Walker, Personnel Director, Civil Service Office, City Hall, Lakeland, Florida, or C. D. McIntosh, Jr., Director of Department of Electric and Water Utilities, City Hall, Lakeland, Florida.

WHO'S WHO in—
Electrical Equipment Representatives
Write for free copy of EERA Directory
C. W. SWARD, Executive Director EERA
1675 Fifth St. Clermont, Florida

ASSISTANT SALES MANAGER

Rigid Aluminum Conduit and related products. Unusual opportunity for seasoned sales executive with college education. Practical experience with electrical contractors and jobbers prerequisite. Requires some travel. All qualified applicants will receive consideration for employment without regard to race, creed, color or national origin.

HARVEY ALUMINUM
Attn.: John Frankel
19200 So. Western Ave., Torrance, California

ELECTRICAL ENGINEERS

for

TENNESSEE VALLEY AUTHORITY

TVA needs electrical engineers, for its Divisions of Design and Construction, to work on its expanding program.

FOR DESIGN at Knoxville Tennessee. Beginning salaries $6600, $7600 and $8950 depending upon qualifications. To work on the design of electrical features of hydro and steam generating plants and other structures.

FOR CONSTRUCTION at various projects in the Tennessee Valley area. Beginning salary $7600 for engineers with 2½ to 3 years experience on heavy construction, preferably steam plants. To do engineering inspection of the installation of electrical features of hydro & steam plants.

All positions carry automatic within grade increases for satisfactory service, liberal vacation and sick leave, retirement, hospitalization and insurance benefits.

Send resume to
EMPLOYMENT BRANCH
TENNESSEE VALLEY AUTHORITY
Knoxville Tennessee

INDUSTRIAL ENGINEER

The City of Lakeland, Florida, Department of Electric and Water Utilities, is accepting applications for position of Industrial Engineer. Applicants must have degree in mechanical, electrical or industrial engineering, with at least five years supervisory or staff experience in public or private utility plant. Approximately ten years experience in various phases of industrial engineering. Excellent opportunity. Salary $10,000 to $12,000. Retirement, leave and insurance benefits. Contact Emory E. Walker, Personnel Director, Civil Service Office, City Hall, Lakeland, Florida, or C. D. McIntosh, Jr., Director of Department of Electric and Water Utilities, City Hall, Lakeland, Florida.

10—Surplus dual fuel cylinder heads, Nordberg, 21½" bore, dual fuel engine. Also other surplus Diesel parts and equipment. Advise needs.

FS-7265, Electrical World
645 N. Michigan Ave., Chicago 11, Ill.

Meetings Calendar

SEPTEMBER

Association of Illinois Electric Cooperatives—Annual Meeting, Springfield, Illinois, Sept. 6-8.

Northwest Public Power Association—Power Use Section Annual Workshop, Pacific University, Campus, Forest Grove Oregon, Sept. 6-8.

• **Michigan Municipal Utilities Association**—Fall Conference, Grand Haven, Michigan, Sept. 6-8.

National Rural Electric Cooperative Association—Region IV Meeting, Columbus, Ohio, Sept. 7-8; Region V Meeting Eau Claire, Wisconsin, Sept. 11-12; Region III Meeting, Admiral Semmes, Mobile, Ala, Sept. 25-26; Region I Meeting, Richmond, Virginia, Sept. 28-29.

Rocky Mountain Electrical League—Annual Fall Convention Jackson Lake Lodge, Moran, Wyoming, Sept. 10-13.

Edison Electric Institute—AGA, Accounting Section Organization Meeting, The Netherland Hilton Hotel, Cincinnati, Ohio, Sept. 11-12; Meter and Service Committee, Hotel Leland, Springfield, Illinois, Sept. 24-27; Industrial Relations Committee, Annual Round Table Conference, Drake Hotel, Chicago, Sept. 25-27.

Southeastern Electric Exchange—Power Coordination Committee, Henry Grady Hotel, Atlanta, Georgia, Sept. 12; Accounting Section Conference, Atlanta Biltmore Hotel, Atlanta, Georgia, Sept. 28-29.

• **Institute of Radio Engineers**—Conference on Technical-Scientific Communication, Philadelphia, Sept. 14-15.

Public Utilities Association of Virginia—43rd Annual Meeting, Greenbrier, White Sulphur Springs, W. Virginia, Sept. 14-15.

American Institute of Electrical Engineers—Petroleum Industry Conference, Jung Hotel, New Orleans, Sept. 17-20.

NEMA—Technical Committee, Power Circuit Breaker group, NEMA office, New York City, Sept. 19; Codes and Standards Committee, NEMA office, New York City, Sept. 28-29.

Electric Companies Public Information Program—1961 Workshop Conference, Brown Palace Hotel, Denver, Sept. 20-22.

Northwest Electric Light & Power Association—54th Annual Meeting, Sheraton-Portland Hotel, Portland, Ore, Sept. 20-22.

Missouri Valley Electric Association—Accounting Conference, Sheraton-Jefferson Hotel, St. Louis, Sept. 21-22; Sales, Rural and Home Service Conference, President Hotel, Kansas City, Sept. 27-29.

National Power Conference—Sponsored by American Institute of Electrical Engineers, and American Society of Mechanical Engineers, St. Francis Hotel, San Francisco, Sept. 24-27.

Pennsylvania Electric Association—Accident Prevention Committee, Bellevue Stratford, Philadelphia, Sept. 25-26; Annual Convention, Bellevue, Stratford, Philadelphia, Sept. 27-28.

Southeastern Electric Exchange—Accounting Section, Atlanta Biltmore Hotel, Atlanta, Sept. 28-29.

OCTOBER

American Gas Association—Annual Meeting, Dallas, Oct. 1-4.

• **International Association of Electrical Inspectors**—Eastern Section, Annual Meeting, Warwick Hotel, Philadelphia, Penn., Oct. 9-11.

Electrical World's Fifth Electric Heating Conference—Sheraton-Park Hotel, Washington, D. C., Sept. 25-26.

• Additions this week.

Advertising Index

Allis-Chalmers Mfg. Co....2nd Cover, 34
Anderson Electric Corp. 55
Asplundh Chipper Co. 93

Bartlett Mfg. Co. 56
Biddle Co., James G. 95
Blackburn Corp., Jasper 57
Buffalo Forge Co. 13
Burndy Corp. 52

California Federal Savings & Loan Ass'n 106
Chance Co., A. B. 59, 83
Chapman Chemical Co. 99
Colorado Fuel & Iron Corp. 82
Combustion Engineering, Inc. 110, 111
Crescent Tool Co. 73

Directory of Electric Utilities 119
Directory of Engineers 122
Dossert Mfg. Corp. 69

Edellis Engineering 58
Edison Industries, Thomas A. 9
Electric Machinery Mfg. Co. 32, 33
Electrical World 120, 121
Electronic Control Products 81
Engineers, Directory of 122

Fanner Mfg. Co. 64
Fargo Mfg. Co., Inc. 57
Foster Wheeler Corp. 12

G&W Electric Specialty Co.. 72, 80, 100
General Electric Co. 103, 112
Graybar Electric Co., Inc. 54, 84, 90

Haley & Co. Inc. R. G. 54

Humble Oil & Refining Co. 107

Indiana Steel & Wire Co. Inc. 108
Ingersoll-Rand 8
Irwin Auger Bit Co. 100

Jackson Products Air Reduction Sales Co. 80
Jennings Radio Mfg. Corp. 18

Kearney Corp., James R. 76, 77
Klein & Sons, Mathias 89
Kuhlman Electric Co. ..... 4th Cover

Lapp Insulator Co., Inc. 60, 61
Line Material Industries 14, 15, 16, 17

Metalfab Inc. 92
Meyer Machine, Inc. 72
Milbank Mfg. Co. 97
Moloney Electric Co. 10, 11

Newport News Shipbuilding & Dry Dock Co. 27

Ohio Brass Co. 25, 26
Okonite Co. 4
Olin Conductors Metals Div. 104

Penn-Union Electric Corp. 63
Pfaff & Kendall 62
Pitman Mfg. Co. 19, 20

Roll-A-Reel 92
Rome Cable Div. of Alcoa ..... 3rd Cover

S&C Electric Co. 86, 87
Searchlight Section 123
Shaw-Perkins Mfg. Co. 106
Sherman & Reilly, Inc. 91
Simplex Wire & Cable Co. 75
Southern States, Inc. 30, 31
Sprague Electric Co. 56
States Co. 74

Thiel Tool & Engineering Co. 97

United States Borax & Chemical Corp. 85
Utility Tool & Body Co. 92

Westinghouse Electric Corp. 6, 7, 28, 29
Wheeler Mfg. Co. Griscom-Russell Co. 109

PROFESSIONAL SERVICES 122

CLASSIFIED ADVERTISING
F. J. Eberle, Business Mgr.

EMPLOYMENT OPPORTUNITIES 123

EQUIPMENT (Used or Surplus New) For Sale 123

Is yesterday soon enough?

Chances are Alcoa worked *yesterday* on precisely what you will need *tomorrow*.

Alcoa has been working on aluminum overhead conductor problems—and successfully solving them—longer than anyone else in the business.

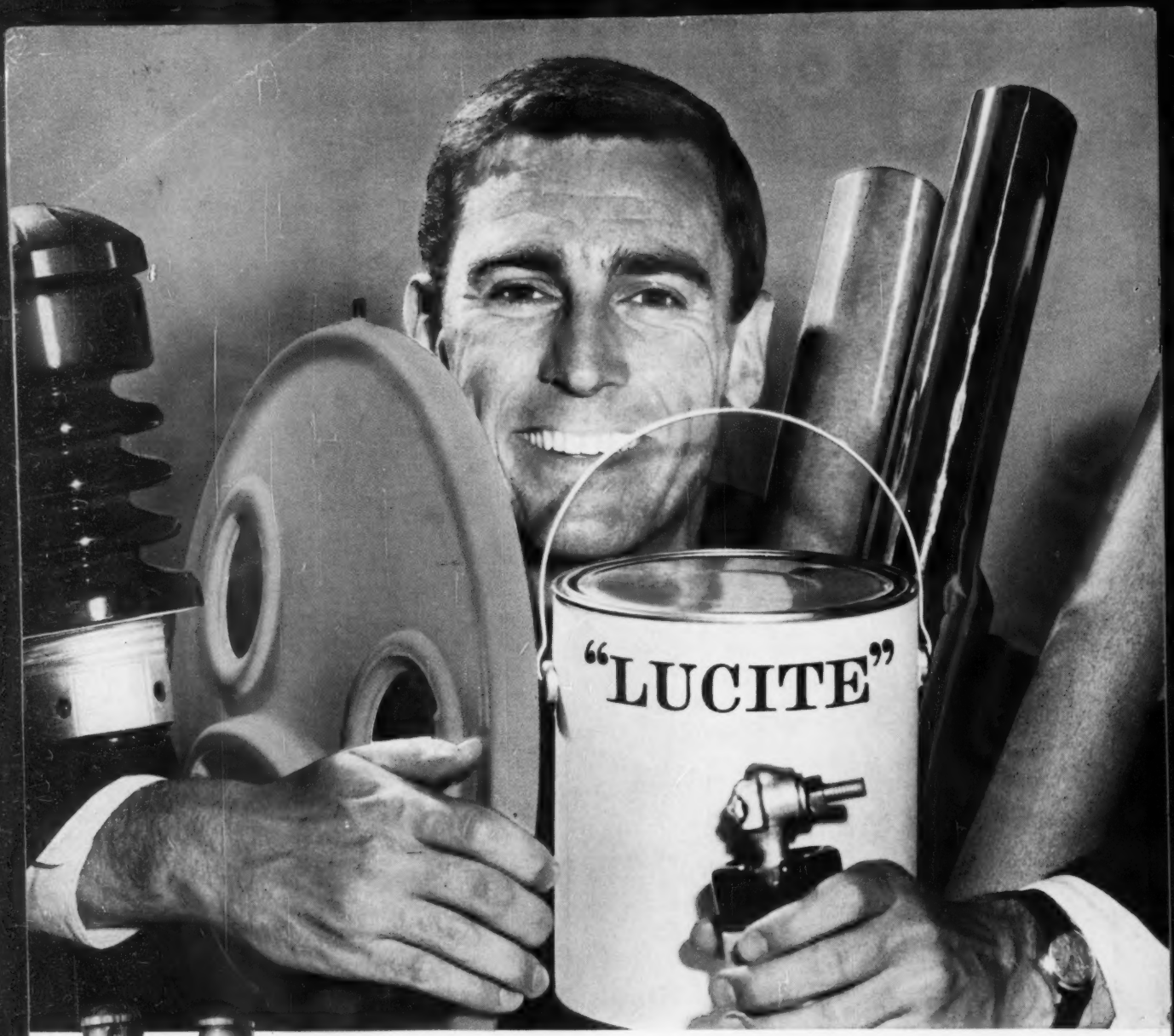
Take a look at the record. Alcoa supplied conductor for the first all-aluminum conductor installation in 1899—it is still in service. The first Alcoa® ACSR was shipped in July of 1909. Even EHV is history—Alcoa developed ACSR for handling 220 kv way back in 1913.

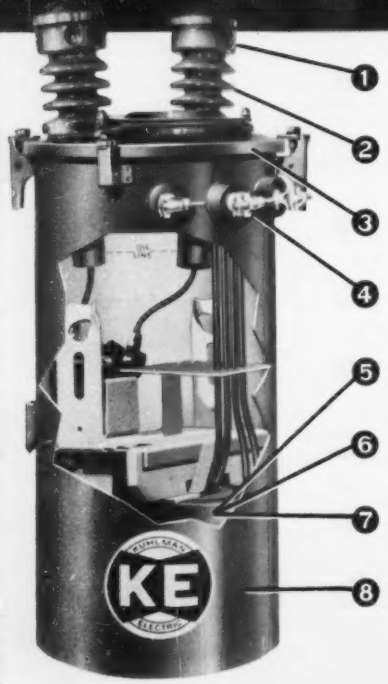
Since those early pioneering days, we've had a hand in almost every major transmission line development. For example, Alcoa's 2.32-inch ACSR: you'll find it on two experimental 460-kv lines energized in 1960.

What has this to do with you? Consider. Out of this experience has come the industry's largest corps of field advisors —ready to work for you today. A complete line of accessories and conductors—the only single source available to you today. A guarantee of 62% minimum conductivity—at no extra cost to you today. The most extensive technical data on aluminum—available to you today.

And what of tomorrow? Then—as now—Alcoa research will answer utilities' demand for new products and techniques in the same way: Is yesterday soon enough?

ALCOA
ROME CABLE
DIVISION





Shopping for more value this year?

ONLY KUHLMAN TRANSFORMERS GIVE YOU ALL THESE EXTRAS AT NO EXTRA COST...

1 "Quick-Grip" connectors **2** sleeve-type bushings **3** Celuclad covers **4** low voltage connectors for copper or aluminum conductors **5** SPI-65* super insulation **6** shielded primaries **7** extra end-turn insulation **8** "Lucite" all-weather finish. Your local Kuhlman representative has all the facts. Call him today and find out about all the exclusive features offered this year by Kuhlman.

**Licensed under Westinghouse Insuldur® patent rights.*

KUHLMAN TRANSFORMERS

KUHLMAN ELECTRIC COMPANY, Birmingham, Michigan

Manufacturers of transformers since 1894

FACTORIES: Bay City, Mich. • Crystal Springs, Miss. • Salinas, Calif.